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IMPROVEMENTS FOR NEW YORK

Mayor McClellan Favors a Municipal Lighting Plant—Telephone and Lighting Monopolies Receive a Setback—Report of Improvement Commission

By George B. McClellan

IT needs no prophet to predict that the city of New York will undergo a greater transformation within the next ten years than has taken place in the past decade. Mayor McClellan not only appreciates this fact, but takes the initial steps toward its realization. The Editor of the *MUNICIPAL JOURNAL* proposes to let him speak for himself in the following excerpts from his annual message, and from the report of the New York City Improvement Commission, which he appointed at the behest of the Municipal Art Society a year ago.

PUBLIC LIGHTING

I am in favor of municipal ownership and operation of an electric lighting plant to light the streets, parks and public buildings of New York.

I do not believe that government should engage in any service which can be done better or as well by private enterprise, or should invade business fields in competition with the legitimate trade of the citizen. Where service rendered by private corporations is unsatisfactory, either because of its inferiority or excessive cost, it becomes the province of government to take control of that utility for its own uses. The prices which the city is compelled to pay for gas and electric light are so out of proportion with the charges in other cities that they must be extortionate. No relief is in sight, as there appears to be an absence of real competition.

This matter has received the attention of the Board of Estimate and Apportionment, and at its last meeting, after

hearing the opinion of the Corporation Counsel and Judge Dillon, a commission was appointed consisting of Prof. George G. Seaver, of Columbia University; W. T. Cary Hutchinson, electrical engineer; and Nelson P. Lewis, the engineer of the Board of Estimate and Apportionment, and instructed to report, as soon as possible, general plans and estimates of cost for a municipal lighting plant for the streets, parks and public buildings of the city as a whole, by boroughs and by districts. This project if decided on will be greatly aided by the use of the rights reserved in grants heretofore given to the Consolidated Telegraph and Electric Subway Company, and the Empire City Subway Company, and by virtue of which these companies have constructed and now maintain their conduit systems. Section 4, paragraph 3, of the agreement of May 15, 1891, is as follows:

"Said party of the second part shall without charge, supply to The City of New York all space in said subways, conduits and ducts, necessary for its electrical conductors, and the electrical conductors of each separate department of said city

which may now or hereafter be required."

FREE USE OF CONDUITS

Here we have the right to the free use of the conduits in which to place wires for the transmission of electrical currents. This right removes from the discussion a large element of expense, and seems to leave it open to the city, even if it should not build its own generating plant, to per-



GEORGE B. McCLELLAN
Mayor of New York

haps secure in the open market the electrical current, conveying it if necessary, from localities outside the City or State of New York.

I do not apprehend that the matter of purchasing the lamps and poles now in use or, if that be inadvisable or unprofitable, supplying others in their stead, would offer any serious problem.

In connection with this subject, it is suggested that still another economy may be effected by the utilization of the waste and refuse collected by the Street Cleaning Department, for this, it is urged by competent authority, will very likely generate all the current needed for lighting in streets, avenues, parks, docks and public buildings of the entire city.

The experience of many cities and towns in England, Ireland, Scotland and Wales has demonstrated that their lighting has been made possible by employing their mixed refuse as fuel for the making of steam, which in turn is utilized in the generation of electric currents. The process calls for well-designed, well-built and intelligently managed destructors. The incinerator used by the Street Cleaning Department in West Forty-seventh street, where a current is generated for lighting the stable and dock, shows the practical results that are obtained even on so small a scale.

Data has been furnished showing the very considerable extent to which this method is carried, especially in the cities of England, and the actual product per ton of refuse. The Borough of Woolwich, in London, has recently established a destructor and in connection with it a complete electrical equipment, which is in practical operation. Brentford, with one small destructor, erected four years ago, and burning only 14 tons of refuse in twenty-four hours, pumps 600,000 gallons of sewage in that time, besides supplying light to the stable and plant. Gloucester lights its streets with its waste, using no other fuel. Liverpool utilizes its refuse in the same way. In Sheerness the destructor plant is within eight feet of a public school, and is so inoffensive as to cause no complaint.

There are scores of illustrations in Great Britain of the successful operation of these plants. With 5,500 tons of refuse gathered daily by the Department of Street Cleaning—twice the per capita quantity collected in London—New York has a power producing fuel that should be used profitably. It would seem feasible, therefore, to settle two propositions at the same time—that of municipal lighting and that of utilizing the city's waste as fuel for the generation of electricity. The subject is an interesting one, and it is hoped that it will receive careful consideration by your Honorable Body.

While the right and authority of the city to establish and maintain a plant for supplying light to the public streets and buildings appear from the recent opinions of the Corporation Counsel and Judge Dillon to be settled, it may be that when such a course is determined upon, interested persons may resort to vexatious litigation to retard or defeat if possible the proposed plan. For the purpose of removing even the semblance of a hope of such a result, I have caused to be prepared a measure for introduction in the Legislature about to convene. This measure will be simply

declaratory of the right and power already existing in the city, but its enactment may prevent many so-called taxpayers' suits by which private interests may seek to impede the institution of a public improvement.

LIGHT PRODUCED FROM REFUSE

According to the best data obtainable, the experience of many cities and towns has demonstrated that the municipal lighting of a city or large town is always possible if its mixed refuse is employed as a fuel to evaporate water to steam, and the steam is utilized in the generation of electric currents. This calls for well-designed, well-built and intelligently managed destructors without which the experiment is likely to be unsatisfactory.

From such available records as I consider it safe to accept without personal verification, I have compiled the following brief notes of the practical results which have attended the lighting of streets on this plan in other cities and towns.

In London several of the metropolitan boroughs have an excess of power which they apply to the purpose of electric lighting.

Fulham gives 26.62 kw. hours per ton of refuse burned as the average power available for lighting during a year.

Hackney, on a special test, the engines running non-condensing, gave the salable power as 54.2 kw. hours per ton of refuse burned.

Shoreditch, which has the oldest destructor in London, reports an excess of power over that needed to operate the plant, of 20 kw. hours per ton of refuse.

Stepney reports 32 kw. hours per ton of refuse.

Owing to the very satisfactory results obtained with the older installations, the new destructor in the Borough of Woolwich, which has not been in operation long enough to have had its results published, was built with a complete electrical equipment, the power to be used for lighting.

Throughout England, Ireland, Scotland and Wales a large number of municipal destructor plants are equipped to do electric lighting and traction, and show very satisfactory results. Other plants in towns where the light was adequately provided for, were built to do the pumping of the town's sewage or water supply, and the power available for these purposes may be converted into electrical units with perfect safety, since it must be remembered that though the power is not actually applied to the end of producing light, it might very well be made to do so if it should appear desirable.

Accrington applies its excess power to electric lighting, and reports 25 kw. hours per ton of refuse.

Bangor gets only 20 kw. hours.

Brentford, with a small destructor, erected in 1900, burning only 14 tons of refuse in 24 hours, pumps 600,000 gallons of sewage in that time, besides supplying light to the stable and plant.

Cambridge burns 32 tons of refuse per day, and gets 140 horse-power for 24 hours, which is used in pumping sewage. This is equivalent to 5.3 kw. hours per ton of refuse.

Cleckheaton, which uses its power for electric traction, has 35 kw. hours per ton of refuse.

Colne reports only 20 kw. hours.

Dartford erected a municipal destructor plant in 1903,

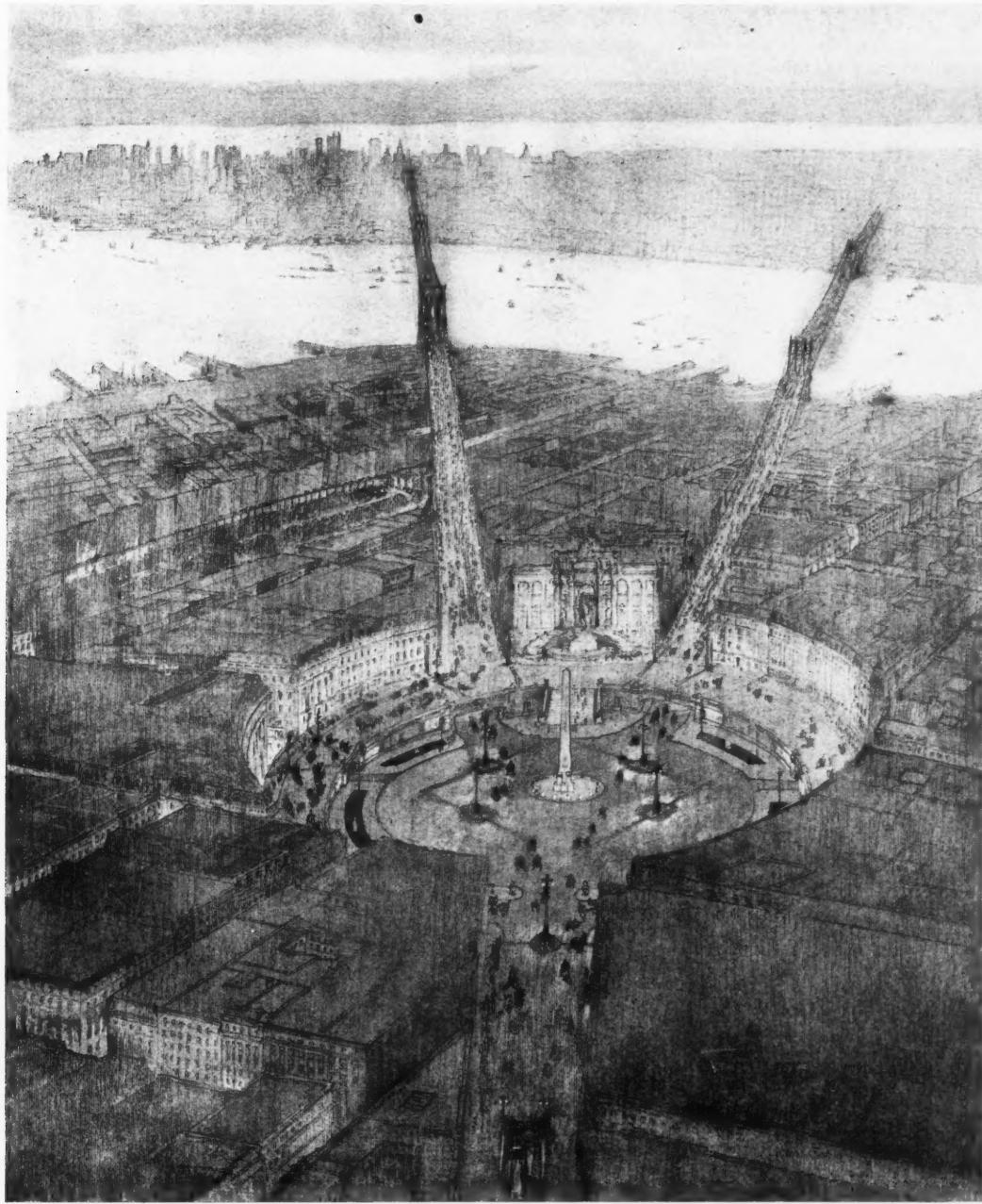
based on the best results of English experience. It is equipped not only to pump all the sewage of the town, but it is expected to supply all the electric current the town needs until the demand for that form of power increases materially.

Darwen reports 33 kw. hours per ton. The electric plant, before the erection of the destructor, was equipped to supply power to the street railways as well as the municipal lighting. The destructor plant was arranged to supply

Gray's reports 33 kw. hours per ton as the available power used in electric lighting.

Liverpool was not restricted by law, and for many years used to send all its refuse out to be dumped at sea. The figures are not available, but there is said to be material economy in the present system of burning everything except steam ash, and applying the power so obtained to electrical generation.

Llandudno reports 32 kw. hours per ton of refuse.



COMMON PLAZA FOR THE APPROACHES TO THE EAST RIVER AND MANHATTAN BRIDGES IN THE BOROUGH OF BROOKLYN

power to the electrical plant. Since this installation the coal bill has been divided by two, it costing very little more to fire the destructor than the coal grates.

Fleetwood is said to do all of its municipal lighting with power from refuse combustion, but the figures are not available.

Gloucester reports an excess power of 35 kw. hours per ton of refuse, and lights its streets with this without the aid of any other fuel.

Lytham, at a labor cost of 16 cents per ton, disposes of all its refuse, using the power for sewage pumping and works lighting, and burns no coal in accomplishing these hitherto expensive operations.

Mexborough, with a labor cost of 22 cents, burns 20 tons per day, and from the power thus obtained lights 213 16 c. p. bulbs and 8,500 c. p. arcs.

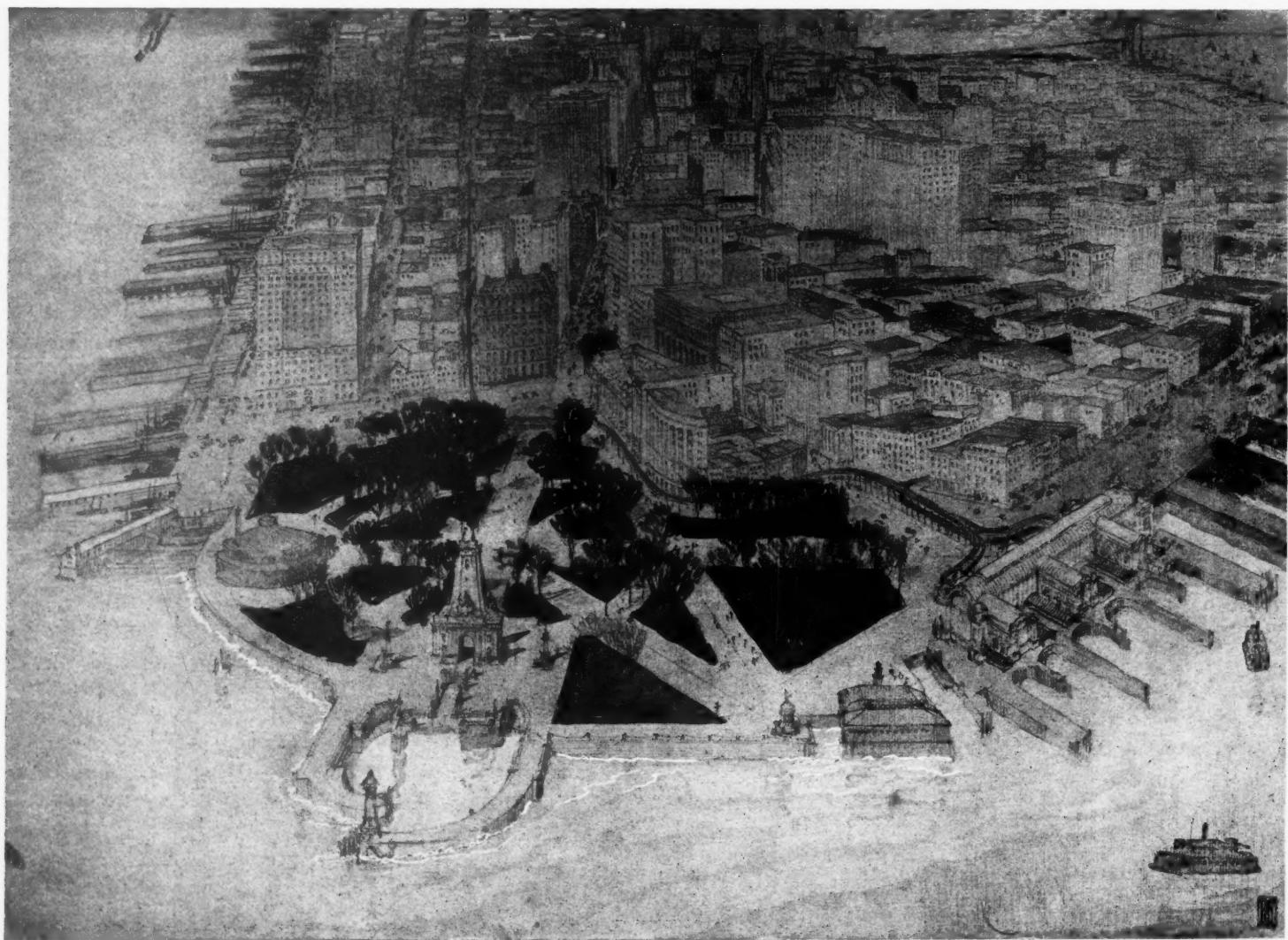
Nelson, at a labor cost of 25 cents, has an excess power of 40 kw. hours per ton, which is used in electric traction.

Rhyl reports 15 kw. hours per ton.

Sheerness uses its power to pump the town water supply. The water pumping station was in a central location, and before the installation of the destructor was a nuisance, owing to the large amount of black smoke issuing from the chimney. The combination of the two plants has been most satisfactory. There has been no nuisance from smoke or gases. The destructor plant is so inoffensive that though it is only 8 feet from a public school, there has been no complaint. Moreover, the possibility of having the final disposition accomplished centrally obviated the necessity of

The results of boiler tests on 15 English destructor plants not equipped with economizers, show an average evaporation of 1.1115 pounds of water per pound of fuel. Of these plants 9 were fired with the unsorted mixed refuse of the town. The rest were burning refuse mixed with sewage sludge, slaughter-house offal and other forms of highly moist waste.

Of twenty-two destructors using economizers, the average evaporation from and at 212 is 1.387 pounds of water per pound of refuse. Of these 17 were burning unsorted town refuse, comprising all classes of the city's waste.



PROPOSED IMPROVEMENT OF BATTERY PARK, SHOWING UNION FERRY HOUSE FOR LINES TO STATEN ISLAND, BROOKLYN AND JERSEY CITY

a long average haul, and cheapened the collection materially.

Southampton has 2 installations. From the one erected in 1887 there is no excess power. From the one erected in 1901, about 12 h. p. for 24 hours suffices to pump the town sewage.

Stoke-on-Trent lights its streets with the power obtained from refuse destruction, without the use of auxiliary coal.

Warrington reports the very high excess of 80 kw. hours per ton of refuse burned.

Wimbleton reports 45 kw. hours.

Patrick has a showing of 27 kw. hours.

The evaporation is a usual and fair basis of comparing the efficiencies of boilers. It is taken from and at 212,

Several analyses of the waste of English towns give the average moisture as about 25 per cent. This is probably high.

Mr. Rudolph Hering, in a paper read before the St. Louis Congress of Civil Engineers this fall, states that the comparative analyses of the waste of New York and London show:

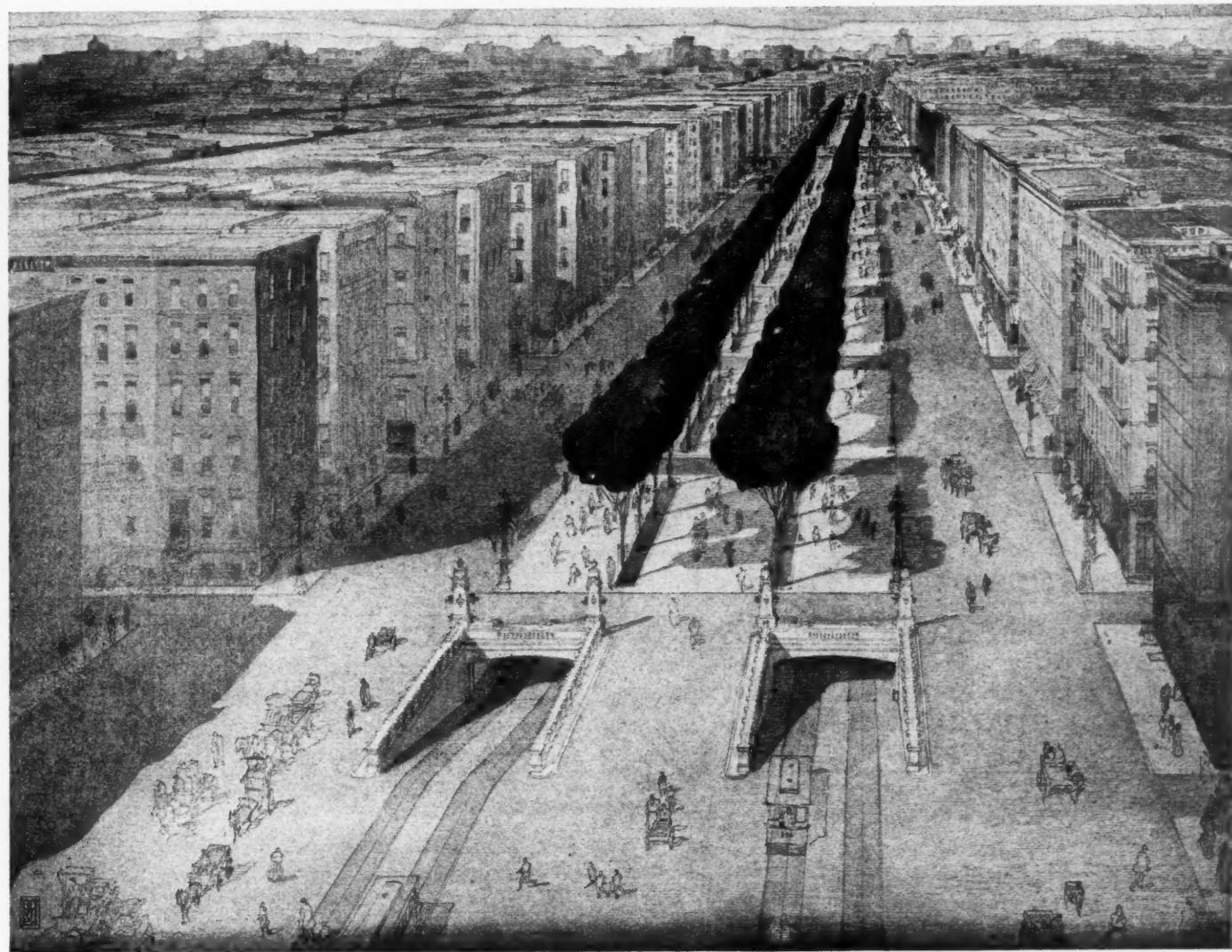
	New York.	London.
Water	8.47 per cent.	9.17 per cent.
Combustible .	30.73 per cent.	32.50 per cent.
Incombustible.	60.80 per cent.	58.33 per cent.

The average available for the four London boroughs given above is 33.2 kw. hours per ton of refuse burned. Probably this figure could be raised materially for New York by the construction of a thoroughly modern and well-

equipped plant. But taking this as the number to reason about, New York's may be assumed to average nearly 5,500 tons of refuse disposed of daily by the department. A simple multiplication gives 177,100 kw. hours available per day for lighting. This figure could be made much larger in practise. That this is true is shown conclusively by the fact that the new destructor plants in England all show available power of 40 to 80 kw. hours per ton. It is the older plants, erected during the nineties, that show the lower returns.

London has less than half the per capita refuse that New York returns show, so that if they can light their streets

approximately 60,000 kw. hours per day. According to the figures calculated above, the power available from the combustion of New York's refuse is three times this requirement, which represents the thorough lighting of all parts of Manhattan and The Bronx. The collection figure is also for those two boroughs. It will be remembered that the calculation of the available power was based on a conservative figure. Allowing for both a considerable error in this estimate and in the lighting requirement, it would still be hard to show that the refuse of New York could under any circumstances be inadequate for the purpose of supplying light to the city.



VIEW OF PROPOSED TREATMENT OF DELANCEY STREET AS SEEN FROM THE WILLIAMSBURG BRIDGE

with the power from refuse combustion, we can surely do the same thing.

In a report to the Commissioner of Water Supply, Gas and Electricity, by Cary T. Hutchinson, under date of May 11, 1903, on the Cost of Building and Operating an Electric Plant for the Public Lighting of the Boroughs of Manhattan and The Bronx, the figures are given for the amount of electric power used by the city. They are not stated directly, and the calculation of separating them may have been slightly in error. He seems to show, however, that the total municipal lighting required at the time of his report about 31,000 kw. hours per day, and he recommends its extension to twice the present scope. This would take

To say that the New York refuse differs in quality from that of English towns, and that generalizations, based on foreign experience are therefore unreliable, is merely to confuse the argument to no purpose. The difference in character is no doubt a fact. But it is no greater than the difference in the refuse of London and Llandudno, in Wales, the returns of which show almost exactly the same power generating capacity. Any difference, as far as New York is concerned, is all in the direction of added fuel value, for there is probably no city in the world so wasteful of combustible boxes, barrels and paper as New York, or where the domestic consumption of coal is as wasteful of carbon in its unsifted ashes.

THE DEVELOPMENT OF THE CITY *

Proposed Improvements as Recommended by the Commission Appointed by Mayor McClellan—A Working Plan for Years to Come

A comprehensive plan for the city's development must necessarily anticipate the future growth of the city for many years to come and be so framed as to meet all possible future requirements so far at least as they can be reasonably foreseen, and be so designed that all its parts shall be consistent, the one with the other, and form a homogeneous whole, in order that any improvements hereafter made may be entered upon with reference to the accomplishment of a definite purpose and along definite lines and not as has been too often the case, without reference to any general plan or regard to the bearing of the particular improvement proposed or its connection with other improvements already made or which thereafter may be deemed advisable. Such a plan necessarily involves not only the laying out of parks, streets, and highways, the location of city buildings, improvement of water fronts, etc., but also questions of more or less detail, relating to pavements, sidewalks, appropriate house numbers, gas and electric fixtures, manner of indicating the streets, location of statues and monuments commemorating historical events, tree planting, and a countless number of other matters, all important and essential if New York is to take its place as one of the great Metropolitan Cities of the World. No plan that fails to take into consideration all the above subject matters can be deemed a comprehensive one.

It is manifest that the subject is one of large and extended scope and necessarily requires the examination and consideration of many important questions, and the Commission feels that there is not sufficient time within the period limited by the ordinance, to enable it to make a complete report which would do justice either to the subject matter involved or to the Commission itself. The Commission deems it, however, proper and incumbent on it at this time, in view of the provisions of the ordinance to make a preliminary report as to its proceedings and the progress made by it in effectuating the purposes for which it was created.

It must be recognized at the outset and will be by all who give any careful consideration to the subject that any proper and comprehensive plan to municipal improvement must, of necessity, involve large and heavy expenditures. Such expenditures have, however, been found in other large cities to be not entirely without return. Apart from the convenience to its own citizens, municipal improvement and

adornment tends to attract strangers and directly contribute to a city's material prosperity. The Commission fully realizes that considerations of expense must necessarily and properly enter into the consideration of any proposed changes or improvements, at the same time it does not conceive it to be its duty to select or recommend the cheapest possible make-shifts. While it proposes therefore to ultimately recommend a plan fully accomplishing, in its judgment the objects desired, it will, nevertheless, be controlled by the consideration that the ultimate benefit must always be commensurate with the expense entailed—in other words, that the essentials are not to be sacrificed to a question of cost, any plan to be of practical value must be framed with due regard to proper considerations of economy.

In this connection it is desirable to remember that it is not the intention of the Commissioner, either now or hereafter, to recommend the carrying out at once, or even within any definite period of time, of all the various changes or improvements it may propose. On the contrary many of them will be neither immediately necessary nor advisable. As above pointed out, the province of the Commission is to formulate a general plan to be adopted for the future—the improvements and changes themselves can manifestly not be made at once. Considerations of expense, if nothing else, would render such course impracticable. They are only intended to be undertaken as and when made necessary and advisable by the continued growth of the city. This fact must be borne in mind in considering the amount of the possible expenditures involved.

Although, as above said, the expenditures necessarily required by any proper plan must be large, they can in many instances be greatly reduced, if the city had the power exercised in many European cities of condemning more than the area actually required, so that the city might reap the benefit to be derived from the enhanced value of neighboring property, and in the judgment of the Commission steps should be taken to secure such changes in the constitution and legislative enactments as may be necessary for the purpose. This method of taking more land than required, with the object by resale at an advance of recouping part of the expense, has been applied in various large cities of Great Britain and the continent where extensive alterations have been undertaken for securing architectural effects, remedying sanitary conditions or improving the city generally, and it is questionable whether many of the improvements would have been otherwise accomplished. Objection to giving the city such power has sometimes been raised on the ground that it might be abused or injudiciously exercised. In these times, however, of increasing municipal activities when so many more extensive powers are constantly being entrusted to those charged with the administration of the city's affairs, such objection can scarcely be considered

* The New York City Improvement Commission is the outcome of a movement inaugurated by the Municipal Art Society during the administration of Mayor Low. Through the co-operation of Borough President Cantor the Society secured the passage of an ordinance providing for the creation of such a commission, the desirability having been first pointed out to Mayor Low and the Board of Aldermen in a lengthy report accompanied by many plans, sketches and suggestions, which was approved on December 9, 1903. The Commission was appointed by Mayor McClellan early last year and the fifteen members offer this preliminary report before the 1st of January, 1905, as required by the ordinance. A more comprehensive report will appear later, after the Commission has had opportunity to give careful consideration to the numerous problems with which it is confronted.—[EDITOR.]

necessarily fatal or conclusive, if proper safeguards and limitations are imposed.

The Commission has had under consideration many proposed changes and improvements, and is still engaged in the examinations and consideration thereof, both with reference to their respective individual merits and their bearing on a general plan. The following are some of the more important which the Commission desires to submit to the test of public criticism.

UNIFORM DEVELOPMENT OF THE WATER FRONT.

The line of the water front of the Greater City of New York has a length of about 450 miles. About forty-four

deem fit. If this policy were changed and all future improvements on the piers owned by the city were made either by the city itself or by its lessees according to certain general lines determined upon in advance, suiting the same to the uses contemplated by the lessees and with a view to appropriate and harmonious architectural effect, some uniformity of construction would ultimately be secured, and in time the water front of the city present an architectural appearance worthy of the city and in great contrast to the medley of different forms of construction now existing as the result of the system of allowing each individual lessee to build along lines of his own individual choosing, without



PROPOSED SUBWAY LOOP TERMINAL FOR THE BLACKWELL'S ISLAND BRIDGE

miles of this represents Manhattan Island of which about thirty-four miles is available for commercial purposes. So much of it as is not at present available for commercial purposes, is available for and forms very suitable area for park purposes. The two principal questions relating to the water front in Manhattan suitable to commercial purposes are its unsightly appearance from the water and the congestion of traffic on the land side. The city owns about fifteen miles of the water front of Manhattan, and is from time to time acquiring more. Improvements on the piers have heretofore been built for the most part by the lessees of the city according to such plans as they might severally

reference to the surroundings. It might not be possible, nor would it be necessary, to have absolute uniformity. Doubtless some latitude would be required to meet commercial requirements, but a general harmonious and symmetrical appearance could probably be secured without any substantial sacrifice of material interests. The roofs of the constructions on the piers can at certain places be adapted for recreation piers, and these at suitable intervals be connected with longitudinal promenades open to the public under proper safeguards so as to afford to the congested lower parts of Manhattan Island access to the water front and thereby in a degree meet the demand for more park

space in such districts. An analogous system of promenades connecting the roofs of warehouses on the docks has been adopted at Antwerp with success.

ELEVATED STREETS FOR NORTH AND SOUTH TRAFFIC

On the North River side of Manhattan Island, where congestion is now very great, and where traffic is bound to increase, an over-head elevated street has been suggested, built along the water front to accommodate the north and south travel, leaving the side streets running from the water front to the interior of the city for the east and west travel. Approaches might extend from this elevated street to the recreation piers aforesaid. Stairs for the descent of foot passengers and approaches by inclined planes for horses and vehicles can be made at convenient places to connect this overhead street with the surface of the ground. By way of illustration this Commission refers to the accompanying drawings of a proposed plan for the Chelsea improvements on the North River, between 12th and 23d streets, showing the effect of a uniform construction of piers and overhead street. Elevated passageways for pedestrians from the ferries across the busy streets on the water front have been also proposed. Where already tried these have been found to work very well. Their application to all the ferries would undoubtedly be a great convenience to foot passengers.

INCREASING PARK AREAS ALONG WATER FRONTS

A large portion of the North River water front at the upper end of Manhattan Island is not adapted to commercial purposes, and might well be reserved for parks. The same is true of certain portions of the frontage on the Harlem River. This Commission has caused to be prepared a map showing the area now owned by the city on the North River and Harlem River for parks, and in a general way additional area which might be acquired along the river, and for the purpose of parkways connecting these river front parks with the parks already laid out in the Borough of the Bronx, so as to have a connected system of parks for the two Boroughs for Manhattan and the Bronx. A parkway along West 181st street, connecting the North River water front with the new parks in the Bronx by way of Washington Bridge and the Grand Boulevard and Concourse is included in the plan, but only so much land need be taken for the purpose as is necessary to give an adequate parkway connection. Washington Bridge, one of the finest structures in the city, would thus virtually be included in the park system and form one of its distinctive features as a link in a park system extending from Fort Washington Park on the North River to Pelham Bay Park near the Sound. A parkway connection is also proposed along Dyckman street connecting Lafayettet Boulevard and the Speedway and the parks on the Harlem River frontage.

A bridge is projected across the Harlem River, known as the Hudson Memorial Bridge, to connect the Northern part of the island, where the Harlem River joins the Hudson, with the mainland. The approaches to such bridge, on both sides should be reserved as a park. The water front at this point is not available for commercial purposes and the large

trees now on the property and its present physical condition make it eminently suitable for park purposes and before any charges have intervened its control should be acquired by the city.

THE WIDENING OF FIFTH AVENUE

It has been apparent for some time that Fifth avenue is no longer wide enough to accommodate the large increase in travel due to the growth of the city. The stoop line on that avenue north of 23d street can be abolished and the sidewalks extended to the building line and seven feet and a half be taken from the present sidewalks on each side and thrown into the roadway, thereby adding some fifteen feet to the space available for vehicle traffic and largely relieving the congestion of that thoroughfare.

An opinion has been given by the Corporation Counsel to the effect that the Board of Aldermen has the right to rescind any rights to vaults under the sidewalks, so that there would seem to be no substantial legal impediment to adopting this plan, and the rapid changes now taking place in this part of that thoroughfare tend largely to do away with the necessity of the area heretofore used for stoops. This Commission strongly recommends that this work should be undertaken as far north as 47th street at once and that, as a further relief to the congestion, trucks should not be allowed to use this avenue during certain hours of the day.

Various suggestions have been advanced for the amelioration of the conditions at the Fifth avenue and 42d street crossing. One plan proposed, provides that one-half of 42d street shall pass under Fifth avenue and the through traffic confined to that half, leaving the other half for the traffic to and from 42d street and Fifth avenue itself, which seems to this Commission the best so far suggested. Another suggestion is to sink the centre only of 42d street so as to allow the surface cars to pass under Fifth avenue, leaving the remainder of 42d street for other surface travel to cross Fifth avenue at grade. Both of these plans contemplate throwing part of the sidewalks of 42d street near Fifth avenue into the roadway, so as to make a circle at that point. The engineers are of opinion this can be done without excessive curtailment of these sidewalks. Neither of these plans would in any way interfere with the rapid transit tunnel, which is at some considerable depth below the surface at this point.,

On Fifth avenue from 59th street to 110th street, the wall of Central Park could be removed, trees be planted on the easterly side of that part of Fifth avenue and that avenue thus practically added to Central Park, thereby furnishing an additional driveway in the park and reducing much of the congestion which now exists. North of 110th street to the Harlem River trees can be planted on each side of Fifth avenue and this roadway treated as a driveway north, connecting Central Park by bridge across the Harlem with the Grand Boulevard and Concourse in the Borough of the Bronx, thereby forming a direct connection between Central Park and the new parks situated in that borough. Later on, if found advisable, a strip can be taken on the westerly side of Fifth avenue from 110th street to Harlem River for the purpose of widening that avenue and making it a parkway.

APPROACH TO BLACKWELL'S ISLAND BRIDGE

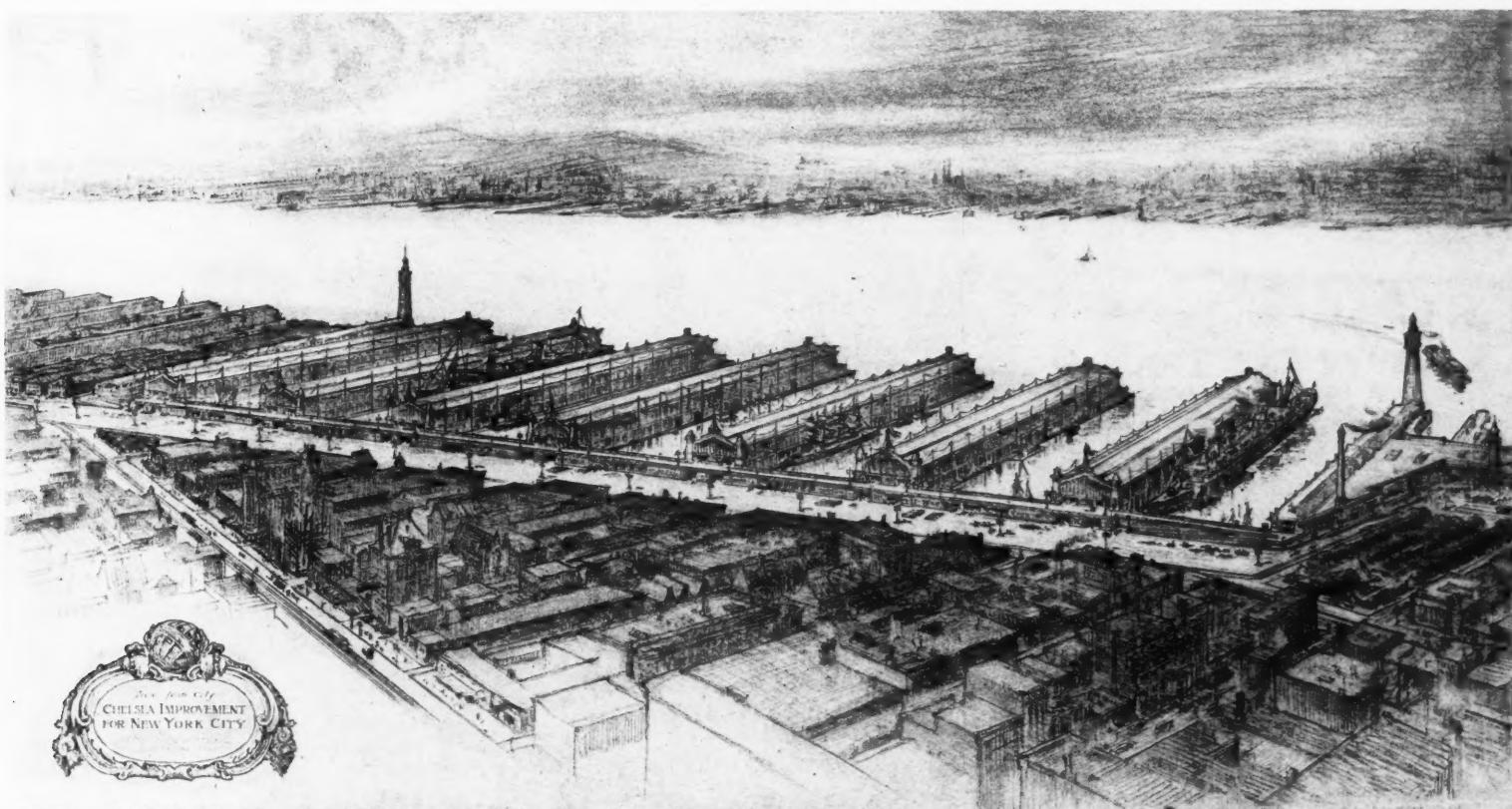
The subject of a proper approach to Blackwell's Island Bridge has been considered by the Commission. An interior street could be constructed from Fifth avenue to the entrance of the bridge, fifty feet wide, and running about midway between 59th and 60th streets. The cost of such a street would probably be less than widening 59th street, and it could be made a much handsomer and more practically beneficial improvement. The street electric cars could run in a tunnel commencing on 59th street at the westerly side of Fifth avenue, passing under the entrance to Central Park and under this interior street to emerge at the entrance to the Blackwell's Island Bridge. This would remove the crossing of the surface cars from the entrance of Central Park at Fifth avenue as well as take such cars off of 59th

possible. While the plan has not been entirely perfected it shows the possibilities of the situation.

NECESSITY FOR THROUGH AVENUES NORTH AND SOUTH

The through thoroughfares connecting the upper part of Manhattan with the down town districts are notoriously inadequate and as the population of the city increases, especially in view of the growing tendency to construct high office buildings accommodating an always increasing number of persons per square foot of surface area, the requirements are bound to further increase.

Several plans for extending Madison avenue south of 23d street have been considered. It could be extended in a straight line to the junction of 17th street and Fourth avenue, thereby making a through connection south by way



PROPOSED CHELSEA IMPROVEMENTS SHOWING ELEVATED ROADWAY ON WEST STREET

street, east of Fifth avenue, thus leaving this interior street above mentioned and 59th street free for ordinary surface travel to and from the bridge. This plan if adopted not only would relieve the anticipated congestion due to the opening of the bridge, but add greatly to the beauty of the park entrance at the 59th street and Fifth avenue plaza. It would also give a direct connection between Central Park and Long Island and if, as has been suggested, Blackwell's Island is destined to be ultimately used as a park, directly connect it with Central Park. Another (see illustration) plan shows a proposed terminal for the Blackwell's Island bridge. The loops have been provided for underground, thus preventing congestion at the entrance to the bridge at Second avenue, securing a park between Second and Third avenues and 59th and 60th streets and making a transfer or direct system of connection with future subway systems

of Fourth avenue and Elm street. Other plans suggested which have the advantage of economy, although apparently not so effective, are to extend Madison avenue in a south-westerly direction to the intersection of Broadway and 21st street or southeasterly to the intersection of Fourth avenue and 19th street. Many other changes are also under consideration.

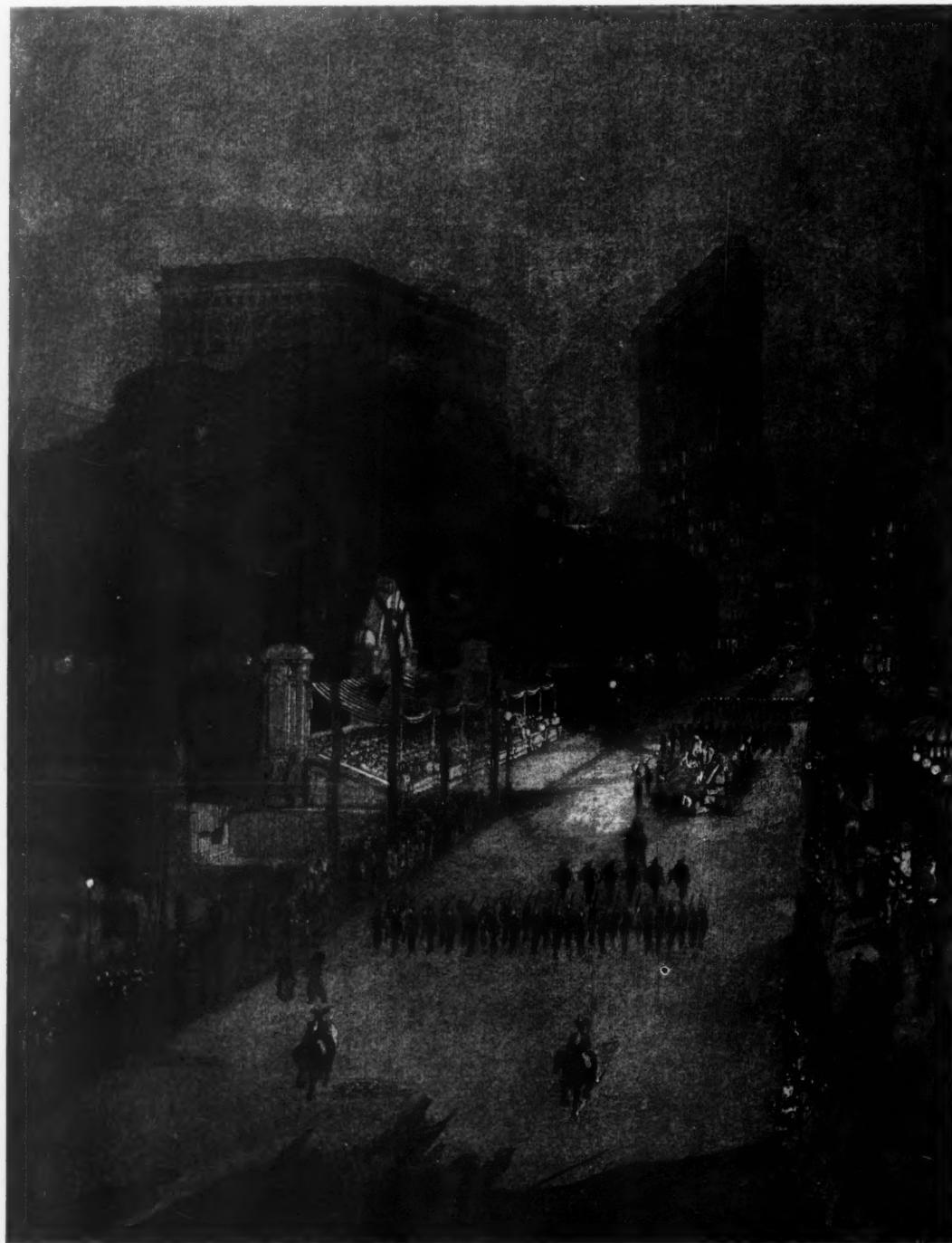
These improvements with an elevated street on the North River water front would add very largely to the through traffic facilities to the down town districts of Manhattan.

PROPER LOCATION OF PUBLIC BUILDINGS

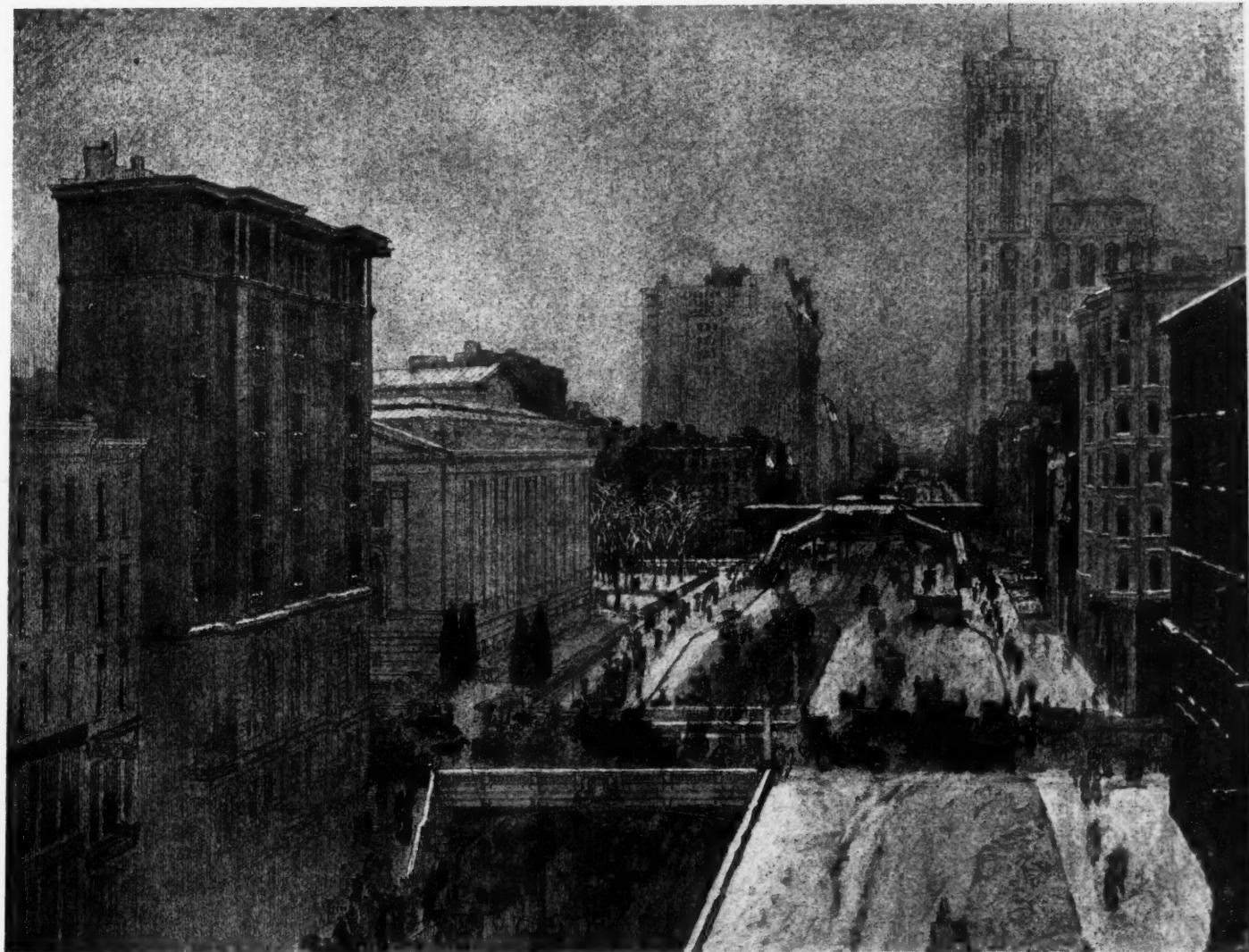
Public buildings and their location is a question which has received much attention by this Commission. Manifestly any proper solution of such question must take into consideration the purposes for which the various classes of

buildings are required and the objects which they are intended to accomplish. City Hall Park has been for many years the center of the administrative and legislative branch of the city government. It is probably as well situated with reference to accessibility to all parts of the greater city as any other point. The City Hall is one of the few good monuments possessed by the city, and it would seem plainly advisable that this locality should be definitely settled upon as the civic center, and that all administration buildings of the greater city as a whole should be grouped around this park. The expense of acquiring property fronting on this park is the principal objection to such grouping of public buildings, but the same objection would very shortly apply to any other site for a civic center that might be selected. The value of surrounding property would be immediately

enhanced and while that required for present needs might be secured at a comparatively smaller outlay, the benefit to be derived by the city therefrom, even under a very liberal construction of "present needs," would apply only to its temporary requirements. In twenty-five or thirty years it would be confronted with a repetition of exactly the same conditions that are now presented. The first cost of the land, which is only a percentage of the expense, would alone in any event be affected, and as against this there would be the possible loss on present investment and the expense involved in the change to another site or in the conduct of the city's affairs from administration offices widely separated. Taking everything into consideration, it is probably doubtful if in the long run the difference in expense would be as material as might seem at first sight. The benefits



REVIEWING STAND, FIFTH AVENUE OPPOSITE TWENTY-FIFTH STREET



SUGGESTED CHANGE OF GRADES AT FIFTH AVENUE AND 42ND STREET

to the city from thus grouping its administration offices in proximity to each other, both for convenience of business, and giving to it monuments worthy of its importance and located in appropriate surroundings, gratifying the civic pride of its citizens and furnishing examples of its progress in the arts must seem obvious.

In this connection it may be well to again call attention to the fact that if the city is given some latitude in its power of condemnation, it could by acquiring sufficient of the property in the neighborhood of City Hall realize the benefit of the increase in rents and value which will doubtless ensue from the construction of additional public buildings. By a conservative utilization of such power those charged with carrying out the plan can doubtless do much to reduce the ultimate expense to the city.

CIVIC CENTERS AND PLAYGROUNDS

Considerations somewhat analogous to those applicable to City Hall Park would seem to equally indicate that other public buildings of a different class, such as schools, libraries, municipal court houses, station houses and engine houses should be grouped in the different sections of the city, care being taken in the practical working out of such method that none are so located as to interfere with the

others or with the several purposes for which they are intended. It would be, for instance, obviously inappropriate that engine houses should be so located with reference to school buildings as to be either a disturbance or a source of danger to children going to and from the schools. These and other similar problems it will doubtless be found easily possible to work out satisfactorily in actual practice.

The location of playgrounds for children and detached parks throughout the city is to a certain extent a branch of the same subject. The special circumstances with reference to the density and character of the population, the natural and physical conditions of the locality, transportation facilities, lines of traffic, accessibility to the persons using or desiring to use the same and many other matters must all necessarily enter largely into the determination of each particular case.

The Commission is convinced that by careful and thorough study and examination of the questions involved, a solution can be found which will redound largely to the benefit of the city, both pecuniarily and otherwise, and be a vast improvement on the present absence of all homogeneous plan or system. There have been constructed in recent years some expensive school buildings which might have given to the city handsome and appropriate monu-

ments, but which are entirely lost, so far as effective appearance is concerned, by the character of the surroundings in which they have been placed, whereas, had they been located properly, they would, while accomplishing equally the objects for which they were primarily intended, have served as adornments to the city.

Important questions in the boroughs of Brooklyn, Queens and Richmond in connection with ferries, bridge terminals, through highways and other matters have received the attention of the Commission.

DEVELOPMENT OF THE SUBURBS

The outlying parts of the greater city present at this time the most promising field for beneficial results. In the largely unbuilt districts, especially in the boroughs of Richmond and Queens, an opportunity is offered, before the growth of population and increase of buildings render it difficult and expensive, to lay out a comprehensive and harmonious system of parks and highways which will not recur. The natural and physical conditions can now be taken advantage of, the mistakes made in the older portions of the city can

be avoided, and the building up of those districts be enabled to proceed with reference to a permanent system of streets and parks. Careful investigation, with the aid of the best professional advice, should be at once undertaken and a complete plan definitely adopted at the earliest possible moment. Delay in this regard will, in view of the rapid growth of those sections, result in the city's being confronted with the heavy expense now attending any improvement in the older portions of the city. This commission cannot in its judgment too strongly urge the necessity of prompt and adequate action.

The foregoing are, as before stated, among the important matters the Commission has under consideration. Many other plans and suggestions as substitutes for or additions to the foregoing have been brought before the Commission and are still pending before it. The Commission is not prepared at this time to make definite recommendations as to all such matters. If it is deemed advisable to extend the time for making a full report, the Commission will endeavor and doubtless be able to report fully within such period.

MONOPOLIES IN NEW YORK

An Organized Effort to Obtain a Fair Reduction in Electric and Gas Lighting and Telephone Rates

NEW YORK CITY is preparing to install a municipal electric lighting plant. After a long dispute about the charges for public lighting with the consolidated companies Mayor McClellan has officially brought the matter of municipal ownership to the attention of the Board of Aldermen in his annual message. The Mayor says:

"I am in favor of municipal ownership and operation of an electric lighting plant to light the streets, parks and public buildings of New York.

"I do not believe that Government should engage in any service which can be done better or as well by private enterprise, or should invade business fields in competition with the legitimate trade of the citizen. When service rendered by private corporations is unsatisfactory, either because of its inferiority or excessive cost, it becomes the province of Government to take control of that utility for its own uses. The prices which the city is compelled to pay for gas and electric light are so out of proportion with the charges of other cities that they must be extortionate. No relief is in sight as there appears to be an absence of real competition."

The Mayor shows further that the city has the necessary authority granted it to enter on the undertaking; that it has reserved the right to the free use of conduits and poles in the franchises granted to private companies and suggests the use of the 5,500 tons of refuse gathered daily by the Street Cleaning Department for fuel in the plant, citing instances from English municipalities which make such use of street refuse. The value of such saving may be estimated from the fact that the fuel cost is usually about one-third of the total cost of operation in such plants.

The companies have emphatically denied the assertion that their charges are excessive, but their officers have avoided examination on the subject even at a risk of being adjudged in contempt. The facts which convince the citizens that \$140 per year for a 2,000 candle-power light burned for 4,000 hours is extortionate are that it is a much higher rate than the cost in cities owning their own plants for the same service; that it is much higher than the charge to other cities by their local companies; that the charge for lighting city buildings is much higher than the companies charge private parties in New York, and that the dividends and interest on the immense capitalization of the company indicate that enormous profits are being made.

EXPERIENCE IN CHICAGO AND BALTIMORE

The experience of the city of Baltimore has been told to Controller Grout by Charles E. Phelps, chief engineer of the Electrical Commission of that city, showing how the threat of building a municipal plant was sufficient to cause the local company to reduce its charge for arc lamps to \$99.92 per year. Of other cities contracting with private companies most are paying \$100, or less, per year. Newark, N. J., pays \$95; New Orleans, \$100; Elizabeth, \$92.50, and Elmira \$80.

Relative to the expense of production by municipal plants Edward B. Elliott, City Electrician of Chicago, testified that the extreme cost per lamp in that city was \$60.00 per year, and that the city has saved, since 1888, when it began operating its own plant \$175,000, besides having its plant to show for the experiment. The total expenditure for construction and operation for sixteen years,

1888 to 1903 inclusive, has been \$3,720,099.40, and the amount that a corresponding number of lamps, year by year, would have cost at the prevailing prices charged by private corporations would have been \$3,895,812.00, making a saving over and above the permanent investment in the plant of \$175,713.60. Figures extending through so many years do not lend credence to the claim which has been made that they had been subject to political juggling, for in sixteen years any gross deception would have come to the surface in a deficit somewhere. Nashville, Tenn., and Evansville, Ind., have also been quoted as municipal plants providing lights at about \$60.00 per year.

The over-capitalization of the New York combine was indicated in a recent address by Colonel Monroe, Commissioner under Mayor Low. The aggregate capital of all the independent competitive electric lighting companies doing business in Manhattan in 1898, including stocks and bonds, was about \$26,000,000, to which \$4,000,000 cash was added at the time they were merged into one company. The Consolidated company is capitalized with \$45,000,000 stock and \$40,000,000 bonds. The bonds bear about four per cent. and the stock has been exchanged for Consolidated Gas bearing eight per cent. at a rate of about two shares of Electric for one of Gas. This would indicate a net earning of \$3,500,000 over every charge for operation on an investment that Colonel Monroe asserts has an actual market value of about \$28,000,000.

Henry E. Youge, Comptroller Grout's attorney, has shown that the Edison Company rates for electricity to private individuals or companies for monthly supplies range from five cents for 15,000 kilowatt hours to three cents for amounts in excess of 50,000 kilowatt hours, and cites Chief Examiner Larkin to show that in Manhattan, in 1903, seventy public buildings were lighted at the average price of 10.7 cents for 750,229 kilowatt hours, which is more than two and one-half times the charge to the city that the same company makes to private citizens.

A MOVEMENT TO SECURE 75-CENT GAS

The gas question has similar interest for the taxpayer. In 1897 a bill was passed by the State legislature, after having been successfully opposed through several sessions by a powerful lobby, allowing the gas companies to continue their charge of \$1.20 per 1,000 cubic feet for one year, after which a reduction of five cents was to be made each succeeding year until dollar gas was attained. It was intended at this time that a farther annual reduction of two and one-half cents should be made for four years, when 90 cents should be the legal price, as the evidence produced before the investigating committee showed that gas could be sold "at a profit" for 50 cents per 1,000 cubic feet. New York is now paying \$24.75 per year for Welsbach street lamps as against \$18.25 paid by Baltimore.

The Merchants' Association has caused a resolution to be introduced into the State Senate calling for an investigation of the entire lighting conditions of the metropolis and the use and earnings of electrical subways. Legislative investigations are not, however, popular at present with the solons at the State Capitol, and a counter suggestion is made for a bill fixing the maximum legal limit for gas at 75 cents.

Here, again, are presented interesting figures regarding the merging of the independent gas companies into the Consolidated. The aggregate nominal capital of all the separate companies on the day of the consolidation was \$17,000,000, of which \$2,139.089 was returned to the shareholders of these several companies, leaving less than \$15,000,000 nominal capital which was turned in to form the Consolidated Company with a nominal capital of \$39,078,000. Of this new capital stock the New York Gas Light Company, one of the subsidiary concerns, was allotted \$7,560,000 for its capitalization of \$750,000 as a separate company, and which had yielded its shareholders during fifty years an average annual return of 40 per cent. Consolidated Gas pays eight per cent., which on this allotment yields \$604,800 per year, or 80 per cent. per year of the \$750,000 actually invested by the shareholders of this company.

An intimation of the possible procedure on the part of the city is given, emanating from the Corporation Council's office, by which it is hinted that there are grave flaws in the franchises of the local gas companies; that practically all the franchises contained provisions expressly preventing them from amalgamating, selling or assigning any of their rights; that the franchises of certain companies have already expired and that they are operating without authority, and that the franchise of the Consolidated Company will expire in 1907.

A hearing before the legislative committee is set for January 25th, on the merchants' resolution referred to above, and there can be no doubt that a strong opposition will develop, for the proposed probing of conduit and subway matters strikes at the very existence of the telephone monopoly.

AN EFFORT TO OBTAIN UNIFORM TELEPHONE RATES

One proposition, in the line of companies, which will be submitted to the present legislature, is a bill establishing a uniform rate for between all the boroughs. It is understood that the companies will accept such a measure and it is rumored that they are contemplating a considerable cut in their tariff for telephones.

When all wires in the city were ordered placed underground by legislative enactment the Consolidated Telegraph and Subway Company was formed to construct subways and lease space therein. Later, when it was found that it would be dangerous to place high and low tension wires in the same ducts, the Empire City Subway was organized to build conduits to carry telephone and telegraph and other low tension wires. The franchises of these companies call for space for city wires; space for any companies which may apply and pay for the privilege; that all excess of revenue over ten per cent. of the cost shall accrue to the city, and that the city may purchase the systems by a payment of the cost price plus ten per cent. As a matter of fact the companies have never had space for wires of independent corporations, and they have never paid one dollar to the city, though by the terms of their franchises an amount estimated at \$6,000,000 should have been paid, and suit has recently been begun by the city to recover the default and annul the franchises.

The two companies are practically a unit, and, too, are

an integral part of the Lighting and Telephone Trust. The control of the subway privileges gives them a monopoly of the city, as it effectually stops all competition.

New Yorkers are not satisfied with being bled by the telephone companies. The statement of the companies to the effect that the larger their service in any city the greater is the per capita expense was considered by a committee of last year's legislature which reported:

"The statistics furnished by the company enable the committee to test the correctness of the universally accepted theory that the cost per capita of operating an exchange increases in nearly geometrical ratio to the increase in the number of subscribers. These statistics not only show that this theory is incorrect, but demonstrate, on the other hand, that, with the growth, after a certain point has been reached, the expense per capita decreases and the earnings increase."

Comparative statistics show that rates are much higher in New York than in any other city of the country. For business service on direct wires 1,000 calls cost, in Chicago \$96.00; in Philadelphia \$78.00; in Pittsburg \$70.00, and

in Washington \$66.00, while in New York the charge is \$99.00. For 5,000 calls, an average of about 16 per day, the charge is from \$33.00 to \$61.00 greater than in these cities named. In Europe the wires are placed underground so that the argument of extra expense on that score is not applicable, the Berlin rate is about \$30.00 per year; Vienna about \$40.00; Paris about \$100.00; London about \$100.00 compared with \$243.00 in New York.

Telephones have become recognized as a business necessity and a single system is certainly a great public convenience, hence it tends to monopoly and demands public control. The argument based on the fact that such a system is dependent on the use of public streets is also advanced to vindicate the right of governmental regulation.

The working out of these problems connected with public utilities by the metropolis will be a matter of lively interest to citizens all over the land, and each move in the struggle between the municipality and the corporations will receive widespread attention. The outline of the present situation is as presented above.

PRACTICE IN SEWAGE DISPOSAL*

The Latest Methods Employed from the Engineer's Side of the Question
—Practical Results Versus Theoretical Opinion—Concluded

By Henry C. H. Shenton

It should not be necessary to empty the septic tank often. Mr. Strachan, in his evidence given before the Royal Commission, said he estimated that septic tanks filled up at the rate of about one-sixth of their capacity per year. This represents what should happen. It ought to be possible to arrange a tank in such a way that nothing but the humus, or black matter left after the sewage has been dealt with, is removed from the tank. Obviously it is wrong to take out organic matter which, if left in the tank, would be liquefied by natural processes, and the author takes it that Mr. Strachan considers that humus will accumulate in a well-designed tank at the rate of one-sixth of its capacity per year. This may be rather an ideal state of things, but it is what should be aimed at in construction and working.

One more point in the septic tank is very important. Again and again one sees works designed with a storm-water overflow coming out of the septic tank; this is surely a mistake. Storm water, up to three times the dry weather flow or more, may well flow through the tank on to the beds, but when the limit is reached at which the overflow comes into action, there can be no possible advantage in taking clean water into the septic tank in order to let it overflow. Obviously the common-sense method is to let it overflow out of the sewer before reaching the septic tank. It will be seen in Fig. 6 that there is an overflow weir just above the septic tank that comes into action after the liquid rises above a certain level, letting the overflow go to the

storm filters or the land. As long as the flow runs to the contact beds, however, there is no reason why storm-water should not run through the septic tank. The solids will remain in the tank, and presumably they hold bacteria sufficient for their own decomposition. It does not seem reasonable to think that the fact that there is clean water between the sludge and the scum can do any harm.

CONTACT BEDS AND CONTINUOUSLY AERATING FILTERS

The contact bed and the continuously aërating filter may well be considered together, more or less under one head, although at first sight there would appear to be very great differences between them. The aim of both is to bring the sewage in contact with the bacteria, and though they do it in different ways, both have the same difficulties to contend with, and both are dependent for their success on giving sewage the right amount of contact with bacteria. In the first place, neither of them will properly deal with sludge. In this respect the contact bed has some advantage. When it is observed that a single continuous filter will produce a good effluent, while a single contact bed will not produce a good effluent with the same sewage, one is apt to form a wrong conclusion. At the first glance it might appear that the continuous filter has a great advantage here, but a little reflection will show the case in a rather different light. For instance, 1 square yard of contact bed, 3 feet deep, would treat about 150 gallons of sewage a day, but the effluent from this single contact would probably not be very good. Imagine, then, a continuous filter, 1 square yard in area, 3

* Paper read before the British Society of Engineers, April, 1904. The first part of this paper was published in the January number.—[EDITOR.]

feet deep, and the same sewage passing through it at the rate of 150 gallons per square yard per day, the effluent would not be very good, owing to the shallowness of the filter. It will be equal to that of the first contact bed of the same size already mentioned. Now add another 3 feet to the depth of the continuous filter, and treat the same amount of sewage on it, and the result will be that the effluent will be very much improved; as much improved, in fact, as the effluent of the first contact bed will be after it has passed through a second contact bed 3 feet deep. Again increase the depth of the continuous filter to 9 feet, and treat 150 gallons of the sewage on it. A perfect effluent may be the result, as perfect, probably, as the effluent from the second contact bed would be after it had passed through a third contact bed 3 feet deep. In the one case we have 3 cubic yards of continuous filter, and in the other we have 3 cubic yards of contact beds, both doing the same work—*viz.*, treating 150 gallons of sewage under different conditions.

If there is plenty of fall, and the area is limited, the continuous filter or the contact bed can be deepened, and area may be thereby saved; the advantage applies to both. The chief difficulty with which both the contact bed and the continuous filter have to contend is the accumulation of black material or humus. This material is, generally speaking, retained in contact beds and discharged from continuous filters, and there is no doubt, in the author's mind, that it ought to be discharged in both cases, or it will ultimately clog up the beds. In the case of contact beds, he thinks that it might be desirable to have some sort of settling pit, channel, or channels, on the surface of the first bed to intercept it. The quantity intercepted would probably be small, as this humus must not be confused with sludge. Sludge should not be given off from the septic tank at all, but if by any chance any comes out, it might be well to catch it if the beds are being worked hard.

In the second place, the author thinks it would be a good thing to make provision for washing out the first contact beds to some extent occasionally—*e. g.*, by opening a large valve when the bed is full, so as to create a good rush out. The humus washed out might be caught in channels on the second beds, or it would probably remain upon the surface, where it could be cleaned off, or it might be well to have a settling pool or channel to catch it between the first and second beds. These ideas are, perhaps, rather more theoretical than practical, as it must be years before a bed could accumulate sufficient humus to clog it up altogether, and then it would not be so very difficult to take out the material and sift it. In the case of the continuous filter, the interstices being very large, this matter gets washed out together with clinker-dust, and becomes a nuisance in the effluent. It is perfectly harmless, but it looks nasty, and it generally has to be intercepted in long channels or pools, or by fine sand filters. It may be considered as a matter requiring the careful attention of the engineer in both cases.

There is one very important difference between the continuous filter and the contact bed. The contact bed can, at a pinch, be overworked severely, and made to do three or four times its ordinary work and produce at the same time

a good effluent, provided it receives plenty of rest afterwards. This cannot be done with the continuous filter. As soon as the flow reaches the point at which it begins to run at all quickly through the filter, purification practically ceases. Such filters are generally arranged with a sprinkler which will not deliver more than the quantity per minute which the filter can purify. Any excess must overflow somewhere else, and it is therefore necessary to make sure that the filters are not only able to deal with the daily flow, but also to deal with the quickest rush of sewage. The contact bed might be filled suddenly, but a filter of anything like the same area would need some separate storage tank or other arrangement to deal with the same sudden rush. This is one of the practical points which may sometimes induce the engineer to use contact beds in preference to filters in certain cases, notwithstanding the fact that a continuous filter would deal with the same flow and produce an excellent effluent, provided the flow could be regulated to suit it.

Another consideration with regard to the continuous filter is the sprinkler. Sprinklers must obviously need considerable attention to ensure the proper delivery of sewage regularly over the whole surface of the filter. There are some admirable sprinklers made, but they need a good deal of looking after. It does not appear that Colonel Ducat received sufficient credit for his continuously aërating filter, which still produces a very good effluent at Hendon. He made a great point of the fact that the cold weather would be likely to adversely affect the filter, and so he put his filters in a house and warmed them with a heating apparatus. This fact, which the author believed has also been acknowledged by Mr. Scott-Moncrieff as applying to his coke-trays—which are a form of continuous filter—seems to be lost sight of by the very enthusiastic advocates of the continuous filter. There can be no doubt that cold weather must affect them in some degree, and this remark refers particularly to small filters. Probably it is not of such serious consequence as Colonel Ducat first anticipated. It is generally admitted that the continuously aërating filters should not be constructed of a less depth than 4 feet, and the author thinks that it will be wise to make them deeper than this wherever possible. He has seen very bad results produced through making a filter of this kind 3 feet deep.

The contact bed possesses some distinct advantages over the filter. It can be more easily and perfectly controlled. There need be no difficulty as to distributing sewage over the surface, seeing that the whole bed is filled before any effluent is allowed to escape. There is not the objection of cold weather affecting it adversely as in the case of the continuously aërating filter. If contact beds do not deal with sludge as satisfactory as was at first supposed, it is quite clear that they have worked for years taking crude sewage, and there can be no doubt that, if sufficient area were allowed, they could deal with it well. This is not, as a rule, practically possible, and so it has very often been found desirable to put in a septic tank, so as not to overwork the first beds. But it is probable that the design of first beds will be perfected in such a way that sludge may be liquefied more thoroughly on them.

There has been a tendency, especially at experimental works, to overwork the first beds; and then to call public attention to the fact that they have sludge up, without giving the beds a chance to recover. It is a very common thing for an ignorant manager to let the surface of his beds get more or less covered with black matter, probably scum from the septic tank. The general appearance is bad, and any ordinary observer would think that the beds were sludged up. This, probably, is quite incorrect; the so-called sludge is black earthy matter without smell, which, in the author's opinion, should never have reached beds which have to do hard work. If we dig down 1 foot or so below the surface in such a bed we shall generally find the bed much clearer, and quite without smell. If we test it we shall very likely find its capacity good in spite of its appearance. If a contact bed is permanently clogged, this clogging, except in exceptional cases, must be due to either road grit or mineral matter, or to the humus already referred to. Road grit should always be kept off beds. The idea of a bed getting sludged up with organic matter does not seem worth troubling much about. It is never likely to happen except where the bed is much overworked, and if it does happen the bed will rapidly clear itself if allowed to rest. It cannot remain permanently clogged in this manner. As a matter of fact, the difficulty due to the clogging of beds has been greatly exaggerated.

Mr. Baldwin Latham pointed out, in evidence given before the Royal Commission, that the reduction of the capacity of the Manchester contact beds had gone on to a certain extent, and had then stopped entirely, indicating that some of the solid matters had been washed out. These clogging matters were sandy, not organic. The depth of contact beds is generally from 3 feet to 4 feet, but they can be made much deeper, and shallow beds can also be made, say, 2 feet deep, or even less. Such shallow beds will give good results in ordinary temperatures, but it seems likely that their capacity would be seriously reduced in times of severe frost, and it must be remembered that the area of shallow beds will be very large.

MR. DIBBIN'S NEW CONTACT BED

The failure of the hard-worked contact bed to deal with sludge in large quantities has forced engineers to adopt some method of sludge treatment as a preliminary step. Mr. Dibdin has now brought forward a contact bed which, it is believed, will deal with the sludge, so that crude sewage may be discharged direct onto the beds. Mr. Dibdin's new bed is filled with slates or tiles laid horizontally. A bed of this kind has a larger liquid capacity than the ordinary type, and is more easily washed out. Sludge will be liquefied in the body of the bed, and what is not liquefied will be washed out and dealt with on the second beds. The first bed thus performs the work of breaking up the sludge. It is well known that in places where the effluent is sludgy, the second beds do not do their full share of work. The first beds take all the sludge and hold it, while the second beds take none. The object of Mr. Dibdin's new contact bed is to get over this difficulty.

THE MULTIPLE CONTACT SYSTEM

This system, which has been brought forward by Mr. S. H. Adams, is also well worthy of attention. Tank effluent

is admitted to a first contact bed, and when this bed is full a syphon is set in action, which delivers the liquid to the second bed, the level of which is only slightly below that of the first bed. When this bed is full, a second syphon is set in motion, which delivers into a third bed. This bed again is discharged, when full, by a syphon. The result is that sewage is brought into contact with a great deal of material with a very slight loss of fall. The process might, perhaps, be justly called "intermittent lateral filtration." This method, which is in use at Sutton, is ingenious, and is likely to be found useful in the future at places where the fall is slight and the sewage needs thorough treatment. It may save pumping.

CONCLUSION

In conclusion, the author thinks it well to state that, as far as his experience goes, there are comparatively few

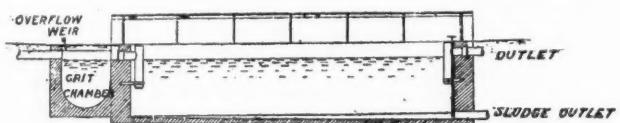


FIG. 6.

works at the present time which do not combine two or more methods in the treatment of their sewage. He will give one instance of some very well-known works near London. There is a large flow of domestic sewage, and the land available is limited in area and unsuitable in character for the treatment of sewage. The method adopted is (1) chemical precipitation, (2) filtration through burnt clay ballast filters, (3) contact bed treatment, and (4) lateral filtration through the surface of the clay land which has been carefully mixed with ashes. The result is an excellent effluent, which actually purifies the dirty river into which it flows, and it is very clear that each of the steps mentioned, combined with the most careful management, are necessary

SCUM BOARD

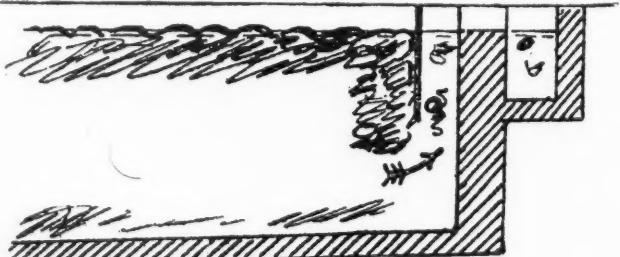


FIG. 7.

to produce a final effluent at this place. At most places where we expect to see the work done entirely by contact beds, by filtration, or by land, we are surprised to see instead land aided by contact beds, or contact beds assisted by filters, and so on. Under the circumstances, it does not seem wise to ignore any system.

The Royal Commission have not yet spoken definitely, but, seeing that they are keeping careful record of results at actual works all over the country, and that their opportunities for obtaining exact information can only have led them to discover the truth, there can be very little doubt

that they will eventually agree that in some places contact beds and filters will be more useful than land, and it is quite conceivable that we shall in the future have the Local Government Board refusing to sanction loans for the purchase of bad land to be used for sewage disposal. On the other hand, it is not to be expected that they will condemn land treatment on good ground, though they may possibly suggest that land is more suitable for treating filter, or contact bed effluent than crude sewage.

Great scientific authorities appear to differ so strongly on the subject of sewage disposal, that the general public regard the whole question as being in a chaotic state, and this feeling is not removed by the very cautious statements made by the Royal Commission, or by their slowness to express any definite opinion. These differences are surely more of a theoretical than of a practical nature. No doubt we go on learning, but we are no longer in the experimental stage, and we know perfectly well that money spent by local authorities in putting in proper works will not be wasted.

The author feels confident that scientists will agree with him in saying that good engineering and careful attention to the details of construction of new works are absolutely essential if the discoveries of scientists, and the principles

laid down, are to have fair play, and that they will welcome a discussion of the purely engineering side of the question, which cannot fail to be of interest alike to the practical and to the theoretical man. The points for discussion are many, and the author does not pretend to have done more than start the subject in this paper. To him it appears that the theory being complete and certain, it is now the duty of engineers to perfect the practical application.

Another point is the necessity of a light roof. In the author's opinion the best form of tank under ordinary conditions is one covered with a light roof, similar to the tank shown in Fig. 6. If the tank is roofed with brickwork or concrete, and is not carefully ventilated, it seems that there is danger from gas exploding inside. Such cases have occurred, and lives have been lost in consequence. With an open tank the wind will blow on the surface of the thick scum and curl it over, and so fill one end with thick sludge, as shown in Fig. 7. If this happens at the outlet a large mass of black matter will soon be given off in the tank effluent. Septic tanks are now built in a variety of forms, and crosswalls, dipping pipes, dipping scum boards, and so on, are made to baffle the flow and to keep the scum from being broken, and to ensure that no solids pass through the tank.

PORTLAND CEMENT*

Its Uses in Engineering Constructions—Changes of Volume in Setting and Hardening, and by Variations in Moisture and Temperature—Continued

By E. Kuichling, C. E.†

IN the preceding numbers of the MUNICIPAL JOURNAL AND ENGINEER, a variety of theories concerning the constitution and induration of Portland cement have been set forth, and we may now consider its physical peculiarities with respect to changes in volume.

CHANGES OF VOLUME IN SETTING AND HARDENING

It has been shown in the foregoing that when Portland cement is mixed with water, a portion of the latter enters into chemical combination with the anhydrous cement as water of crystallization, and that the quantity thus combined varies both with the percentage of water used in mixing and with the age of the sample. According to the experiments of Le Chatelier and Newberry, about 20 per cent. water may become combined in the course of one year, while Prüssing found that only about 2.5 per cent. would be absorbed in twenty-four hours. It might be inferred that this gradual absorption of water should be followed by a corresponding increase of volume, but in fact the changes in dimensions which occur after setting are very slight, and hence it is probable either that the newly formed mass retains in its interstices a sufficient quantity of free water to satisfy the subsequent demands of the material for complete

hydration, or that some of the constituents become superhydrated in the outset, and afterwards impart their surplus water to the remainder without thereby affecting the volume in great degree.

The subject was closely investigated for some years by Le Chatelier, beginning in 1894, and his conclusions were published in the transactions of the "Societe d'encouragement pour l'Industrie Nationale" for 1898. In this paper he states that while it is well known that the hardening of hydraulic cements is accompanied by more or less important changes of volume, yet the observations are somewhat contradictory because a distinction is not made between the *apparent* and the *absolute* volume of the mass. It might be supposed that these two volumes should vary in the same sense, but this is not necessarily true, and in fact the reverse is commonly the case, as will be seen subsequently.

The apparent volume of a briquette of cement is the entire space enclosed by the surface of the mass, and embraces the solid material, the free water and the air or gas contained therein. On the other hand, the absolute volume of such a briquette is the sum of the volumes of the solid matter and the water, the volume of enclosed air or gas not being considered. The apparent volume is therefore determined wholly by the relative positions of the various

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solid particles, and increases as the distance between them becomes greater, independently of any concomitant changes that may take place in the absolute volume.

As is well known, the slaking of lime is attended by a considerable increase of bulk, and hence a small quantity of free lime in a cement is sufficient to produce an appreciable swelling which may amount to several per cent. of the original volume of the briquette. Furthermore, cements of good quality and containing no free lime generally exhibit a slight increase of volume when hardening under water. In the case of Portland cement, this swelling is about 0.2 per cent. in linear dimension, as shown by the concordant experiments of Dyckerhoff, Tetmayer, Blount and Considère. The fact that such a change of volume takes place may easily be demonstrated qualitatively by filling a glass test tube with cement paste of normal consistence, since the tube will burst within a few months; and the same will occur if the tube is filled with compact mixtures of lime and pizzolana.

It may therefore be accepted as a fact that the hardening of hydraulic binding materials is accompanied by an increase of the apparent volume. This swelling has usually been regarded as an increase of the absolute volume, as the combination of the water with the cement should properly result in making the bulk larger. A well-known fact, however, points to a different conclusion. When the cement first begins to set, the moisture on its surface disappears abruptly, as if by rapid evaporation. Now if the combination of the water with the cement is associated with a *contraction* of volume, the water in the interstices of the exterior parts should penetrate toward the interior of the mass and be replaced by air. That such a reduction of the absolute volume actually occurs, and is large enough to admit of exact measurement, is proved by the following experiments which enable us to observe the progress of the induration more directly and accurately than by mechanical tests of the strength of the mass.

Into a number of glass bulbs having a capacity of 70 cubic centimeters (4.27 cu. ins.), each provided with a stem 4 millimeters (0.157 in.) in diameter and hence having a capacity of 0.125 c.c. per centimeter of length, Le Chatelier introduced quickly a mixture of 50 grams of water and from 10 to 50 grams of hydraulic binding material. The larger weight (50 grams) of the latter was taken for the Portland cements, while only half as much was taken for the hydraulic limes and pizzolana mixtures which require a large quantity of water to make a conveniently thin cream. The bulbs were filled by first creating a vacuum therein, and all air-bubbles were then removed by exhaustion, as their presence in the mass would cause a serious error in the results. Finally, the glass stem of each bulb was filled with water to half its height, and its top was sealed hermetically under the flame of a blow-pipe to prevent subsequent evaporation. The progressive changes in the absolute volume of each mass were then manifested by the variations of the height of the columns of water in the stems.

The results of a series of experiments begun in 1894 are given in the following table, the figures therein expressing the contractions of the absolute volume in cubic centimeters per 100 grams of the designated material, while the asterisk

(*) denotes that the glass was broken by an apparent swelling of the mass after previous shrinkage.

MATERIAL.	PERIOD OF OBSERVATION.						
	6 hours.	1 day.	7 days.	1 month.	6 months.	18 months.	5 years.
Boulogne Portland cement (old method of fabrication)....	0.4	0.7	2.0	2.9	—	—	—
Boulogne Portland cement (new method of fabrication)....	0.6	1.0	2.7	4.1*	4.6	*	—
Grenoble natural cement, slow setting	1.2	1.8	3.8	3.9	*	—	—
Grenoble natural cement, quick setting	1.2	1.8	—	—	2.4	3.6	*
St. Astier silicious lime.....	0.0	0.3	1.2	1.8	2.2	2.6	3.0
Teil silicious "grappier" cement	0.0	0.2	0.6	1.5	1.9	2.6	3.0
Ruoms natural silicious cement	0.2	0.9	2.8	3.6	4.5	4.5	4.7
Lagny aluminous plaster of Paris	—	—	—	—	—	3.6	—
Dead-burned dolomite (magnesian limestone).....	—	—	—	—	—	7.0	—
One part calcined flint + 1 part slaked lime	—	0.3	2.5	3.1	3.9	*	—
One part dehydrated kaolin + 1 part slaked lime	—	—	0.5	2.9	3.8	—	—
One part dehydrated clay + 2 parts fat lime	—	—	0.3	0.7	1.1	—	—

These experiments indicate that in most of the hydraulic binding materials, the ultimate contraction or shrinkage of volume after setting is from 4 to 5 cubic centimeters per 100 grams of the substance; also that the time for the completion of the hardening process is very variable. Thus, while the slow-setting Grenoble cement appears to have completed its hydration in seven days, the same process in the quick-setting cement was not finished in eighteen months. Furthermore, the contractions observed in the plaster of Paris, the silicious lime and the magnesian lime seem to be diametrically opposed to the commonly accepted views as to change of volume. It is, however, easy to prove by an entirely distinct method that these contractions are smaller than those which would actually have occurred if all of the material had been fully hydrated. This is done by comparing the densities of the substances in their anhydrous and hydrated states.

Thus for magnesia, the density is 3.65 when anhydrous, and 2.32 when hydrated, while the molecular weight is respectively 40 and 58; the reaction is $MgO + H_2O = Mg(OH)_2$, whereas by molecular volumes we will have $MgO + H_2O = 10.96 + 18 = 28.96$ c.c., while $Mg(OH)_2 = 24.70$ c.c.; hence in hydrating 40 grams of anhydrous magnesia there will be a contraction of 4.26 c.c. in the volume of the components, or of 10.6 c.c. in 100 grams, instead of 6.7 c.c. observed by experiment as outlined above, wherein the hydration began while the bulb was being filled. In like manner it can be shown that for sulphate of lime, the molecular weights are respectively 136 and 172, while the molecular volumes are respectively 46.0 and 73.4 c.c.; and as the anhydrous substance combines with two equivalents of water having a molecular volume of 36.0 c.c., it follows that in the hydration of 136 grains of substance a contraction of 8.6 c.c. must take place in the aggregate volume of the components; hence in a weight of 100 grams of anhydrous plaster of Paris, there will be a contraction of 6.2 c.c., or nearly twice as much as was observed in the above experiment with aluminous plaster, since when this material is too strongly calcined a considerable portion will not become hydrated.

From these experiments Le Chatelier concludes that the

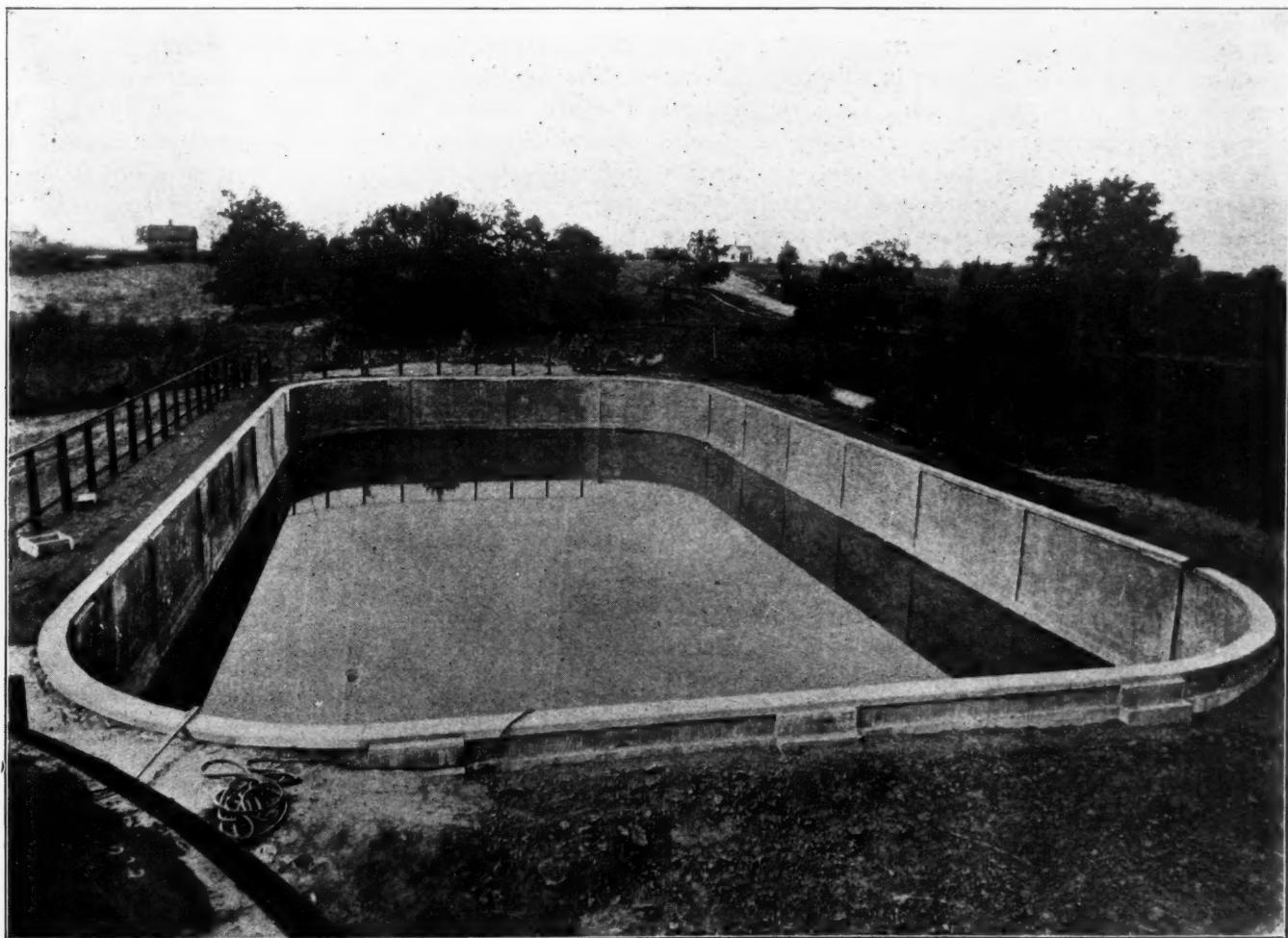
hydration of all hydraulic binding materials is accompanied by an increase of the *apparent* volume and a decrease of the *absolute* volume. For the former no other explanation can be given except that it is a simple phenomenon. In a note added to a recent (1904) reprint of his paper, he states that since making the above investigations, he has observed that the formation of sulpho-aluminate of lime, which produces a swelling or expansion like the hydration of quicklime, was also accompanied by a decrease of its absolute volume; the volume of the sulpho-aluminate being a little less than the sum of the volumes of the aluminate of lime, sulphate of lime and water which are its constituents.

A translation of this paper was published in *Thonindustrie Zeitung* of 1900, p. 1144, and in commenting upon it the editor stated that while he recognized the importance of the subject and the difficulties attending the experiments, yet he did not consider Le Chatelier's conclusions to be fully warranted. He had also made a number of experiments in the same direction, and had found that when Portland cement combined with water and hardened, its volumetric weight increased from 20.0 to 34.8 per cent., while its specific gravity diminished from 16.0 to 15.3 per cent., according to the quantity of water used in mixing and the method of preparing the samples. The noteworthy feature in the process of hydration is that the water which enters into chemical combination with the cement becomes a solid.

OTHER EXPERIMENTS ON CHANGES OF VOLUME

In the use of large masses of cement mortar and concrete, the changes of volume that may occur in the hardening and drying of the material become of great importance, and as it was found by experience that cements differed considerably in behavior during this period, numerous observations were made in order to establish a standard of manufacture by which such changes would be reduced to the smallest practicable limit. The quality of continuing to gain in strength and hardness without appreciable alteration of initial volume, under ordinary variations of temperature and moisture, is commonly called *soundness*. An unsound cement will swell and disintegrate in the course of time, while a sound one will retain its integrity and manifest only slight changes of volume throughout a long term of years. In the present article consideration will be given exclusively to the latter class of cements.

It has been found by careful measurements, made at the same temperatures, that when a mass of Portland cement mortar hardens and dries in the air, it shrinks slightly in volume, whereas if it hardens under water its volume is slightly increased; also, that a slight shrinkage occurs when it is taken from the water and dried in the air, and conversely, that a slight expansion takes place when the dried mass is replaced in water. Furthermore, numerous observations have demonstrated that a mass of hardened



CONCRETE RESERVOIR, CANTON, ILL.—BUILT WITH MEDUSA PORTLAND CEMENT



CONCRETE BRIDGE, ZOOLOGICAL GARDEN, WASHINGTON, D. C.—BUILT WITH LEHIGH PORTLAND CEMENT

cement increases slightly in dimensions when its temperature is raised, and diminishes correspondingly when its temperature is lowered, its behavior in this respect being very nearly the same as that of steel. In view of these facts, it is evident that measurements of change of volume must be made with great care, and that those which relate to different conditions of moisture must be carefully distinguished from those which refer to different temperatures of the mass.

It has also been found in both cases that the variation in volume is greater in test specimens made of neat cement, than in those made with admixtures of sand; and that within certain limits the changes are approximately proportional to the quantity of sand used in the mortar. The character of the sand is likewise an important factor, as the material of which it is composed is generally subject to similar alterations of volume under different conditions of moisture and temperature. Experiments made by Schumann and published in the proceedings of the Association of German Cement Manufacturers for 1881, indicate that when immersed in water the expansion of many varieties of stone is considerably greater than that of sound Portland cement mortar made in the proportion of one part of cement to three parts of sand. The same author also states that the changes in volume of cement and mortar, due to ordinary variations in temperature and degree of atmospheric moisture, are very small in comparison with those which occur when the mortar hardens under water or dries in the air; and in support thereof he cites the results previously obtained by Meier, who found that when hardening under water the length of test specimens of neat cement

sometimes increased 0.1 per cent., while when hardening and drying in air it diminished 0.2 per cent.

The experiments by Schumann relate to ten different Portland cements, with setting periods ranging from twenty minutes to eleven hours, and formed into test bars 100 millimeters (3.94 ins.) long and 500 square millimeters (0.775 sq. ins.) sectional area. The bars were made in pairs, one bar consisting of neat cement and the other of a mixture of 1 part of cement and 3 parts of standard quartz sand. After setting, they were kept immersed in water, and their elongations were carefully measured at intervals of 1, 4, 13, 26, 39 and 52 weeks with the following results:

DESCRIPTION.	No.	Setting. Min.	TIME OF SETTING (OR PER CENT.) AT THE END OF					
			1 week.	4 weeks.	13 weeks.	26 weeks.	39 weeks.	
Quickest setting cement, neat.....	VII	20	0.069	0.113	0.152	0.180	0.198	0.213
Quickest setting cement mortar.....	VII	20	0.016	0.026	0.032	0.037	0.039	0.043
Slowest setting cement, neat,	II	660	0.014	0.029	0.037	0.055	0.065	0.070
Slowest setting cement, mortar	II	660	0.007	0.009	0.009	0.009	0.010	0.010
Cement of maximum elongation, neat	IV	540	0.122	0.154	0.171	0.191	0.199	0.202
Cement of maximum elongation, mortar	IV	540	0.039	0.044	0.048	0.051	0.053	0.057
Cement of minimum elongation, neat	VI	600	0.014	0.026	0.030	0.041	0.050	0.059
Cement of minimum elongation, mortar.....	VI	600	0.004	0.008	0.008	0.008	0.008	0.012
Averages for neat cements	—	—	0.048	0.082	0.104	0.125	0.139	0.146
Averages for mortars	—	—	0.015	0.021	0.024	0.028	0.030	0.033
Rates of average elongations of the mortars to those of the neat cements, in per cent,	—	—	31.2	35.6	33.1	32.1	31.6	32.6

These results show that there is much variation in the behavior of different kinds of Portland cement, both when used neat and when mixed with three parts of standard quartz sand. With sand of different quality, other figures might easily have been obtained, especially if the sand consisted of particles of stone which swelled appreciably when wet. It is also seen that the rate of increase of volume is in all cases greatest during the first week, and gradually diminishes as the material becomes older, thus indicating a gradual reduction in the intensity of the hardening process. Various irregularities in this respect, however, are observable in the quick-setting cements. Furthermore, all the cements in these experiments were entirely sound, and hence the measured expansion must not be mistaken for manifestations of "blowing" or swelling due to original unsoundness, which are vastly greater.

In order to compare the magnitude of the elongations of cement and mortar when hardening under water with those which are exhibited by bricks and various natural stones, Schumann also tested a number of samples of these materials, of the same size and cross-section as the cement and mortar bars described above. The lengths of these samples were carefully measured firstly, in an ordinary dry state; secondly, after two weeks immersion in water, and thirdly, after two weeks subsequent drying in the air. The results were as follows:

MATERIALS.	PER CENT. OF	
	ELONGATION AFTER TWO WEEKS' IMMERSION.	CONTRACTION AFTER TWO WEEKS' DRYING IN AIR.
Averages for 4 kinds of brick	0.013	0.011
Averages for 5 kinds of sandstone	0.065	0.065
Averages for 4 kinds of limestone	0.012	0.013
Averages for 4 kinds of basalt	0.034	0.038
Average for 1 kind of granite	0.006	0.015

From these experiments it is seen that the average elongation of the aforesaid cement mortars under water for two weeks is about the same as that of brick and limestone, but is only about one-half that of basalt, and one-fourth that of sandstone; also that it is at least twice as much as that of granite. The original figures likewise indicate that there is much variation in the elongations and contractions of the different kinds of brick and stone, and hence that no exact conclusions can be drawn, especially as the period of observation of the latter materials was much shorter than in the case of the cements and mortars. To make data of this kind, useful in practice, the observations on each substance should manifestly be continued for a long time with bars of much greater length, under conditions of uniform temperature and humidity. It is also to be regretted that Schumann's experiments did not embrace the shrinkage of cements and mortars while hardening in air.

The results, however, indicate that the changes in dimension which large masses of mortar and concrete will undergo when hardening either under water or in air, depend mainly on the nature of the sand and ballast used in the mixture, as the bulk of the material consists of the latter. Furthermore, many kinds of natural stone expand and contract considerably by changes in temperature; and as the process of induration is usually associated with a marked

development of heat, the influence of this agency on the alteration of volume should also be taken into account. Another factor is the density or strength of the mortar or concrete, as the magnitude of the elongation or shrinkage during the hardening process seems to vary directly therewith; and since this depends on both the composition and the manipulation of the material while being put in place, it follows that uniform results can be expected only under conditions of unusual care in carrying out the experiments.

EXPERIMENTS AT WATERTOWN ARSENAL.

The fact that many natural stones swell slightly when passing from a dry to a wet condition at the same temperature, and shrink correspondingly when the process is reversed, has also been recognized in numerous tests at the Watertown Arsenal, Mass., which are described in the reports of that establishment for the years 1890, 1894 and 1895. In the report for 1890, it is stated that a very decided swelling of the stones was observed in most cases after soaking them for a time in water, and that this effect seemed to increase as the temperature rose. The experiments were made primarily to determine the rate of expansion of building stones by a rise of temperature, and for this purpose specimens 24 inches long, 6 inches wide and 4 inches thick were kept immersed for long periods of time in a tank of water which was maintained at any desired uniform temperature. Observations of elongation and contraction were made on a measured length of twenty inches of the samples in their original dry condition at the temperature of the laboratory, and on placing them in water of the same temperature, the effect of soaking could readily be ascertained; and conversely, the effect of drying the specimens after immersion could also be noted.

The results of the longest of these observations at the Watertown Arsenal, on the swelling of natural stones in passing from a dry to a saturated condition at the same temperature, are given in the following table; and it is seen therefrom that they are not much different from those of Schumann given above. The period of immersion ranged from fifteen hours to nineteen days, but a shorter time than two days occurred in only three instances.

MATERIALS.	No. of determina- tions.	Per cent. of elonga- tion by soaking in water.		
		Average	Maximum	Minimum
8 varieties of sandstone	10	0.052	0.215	0.004
5 varieties of marble	6	0.014	0.060	0.002
4 varieties of limestone	4	0.009	0.021	0.002
3 varieties of granite	5	0.008	0.010	0.006

It may be remarked that the measurements indicate a great difference in the behavior of the different specimens of the same class of stones. In some cases the elongation appears to reach a maximum after several hours, while in others it continues for a much longer time. A few observations also showed a slight shrinkage after the maximum expansion had been reached, and a number of specimens did not return quite to their original length after exposure to higher temperatures. Some of these irregularities may result from the difficulty of making such minute measurements, but in other cases it is probable that a change in degree of moisture causes a slight alteration of length which is retained for a long time.

EXPERIMENTS WITH CEMENTS AND MORTARS

Experiments on the swelling of various cements and mortars while hardening under water were also made in 1883 by E. C. Clarke, C. E., in connection with the construction of the main drainage works of Boston, Mass., the results being published in 1885 in *Trans. Am. Soc. C. E.*, vol. 14, p. 167. Several dozen glass lamp chimneys were filled with mortars made of different brands of American and Portland cements, both neat and with various admixtures of sand. They were then immersed in water, and all of them cracked within three days. New cracks appeared during the following ten days, after which time hardly a square inch of glass remained without signs of fracture. This showed that cement certainly expands in hardening under water, though very slowly, and that the expansion continued for about two weeks. None of the cracks, however, opened appreciably, so that the magnitude of the swelling was evidently slight.

To measure this expansion, Clarke then made a number of ten-inch cubes of similar mortars, a copper tack being inserted in the middle of every side or face. Some of these cubes were kept in the air, while the others were immersed in water, and the thicknesses between tacks were frequently measured by calipers during six months. The results showed that the swelling did not exceed in any case 0.01 inch, or 0.001 per unit of length, and may have been less; and Clarke concludes therefrom that it is too slight to be of consequence. Unfortunately no details of these measurements are given, nor is mention made of any difference in behavior between the cubes that were exposed in air and those which were kept under water.

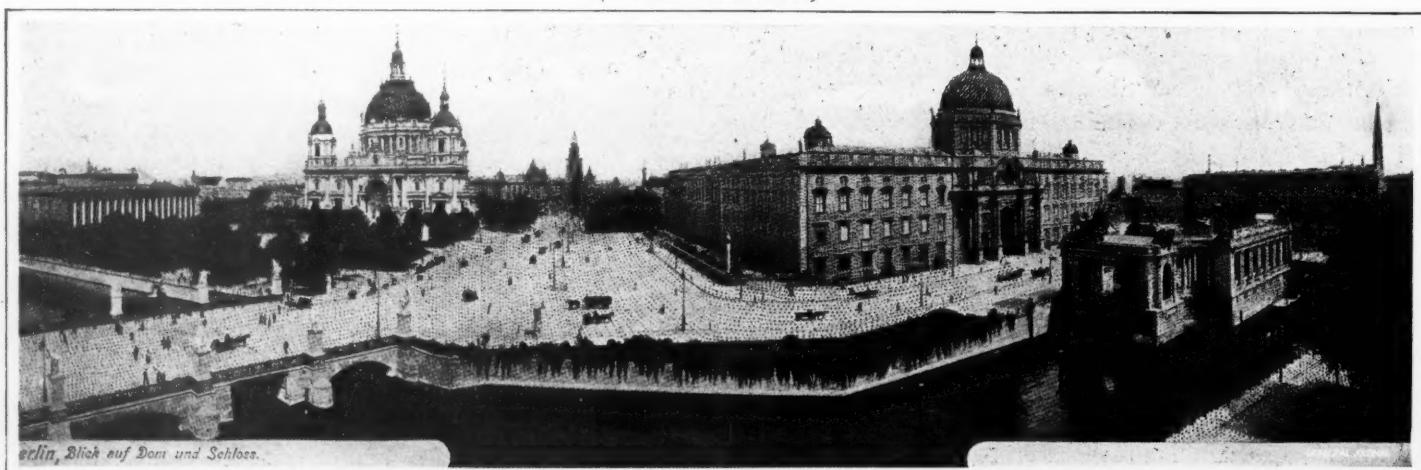
The subject was likewise investigated in 1883 by Bauschinger at the Technical Laboratory of Munich, and an account of his experiments with seven different brands of Portland cement is contained in No. VII of the reports of that institution, as well as in *Trans. Am. Soc. C. E.*, vol. 15, p. 717. To determine the behavior of the materials while hardening, 132 mixtures of cement and sand in various proportions were placed in small glass cylinders and allowed to harden (presumably in the air), with the result that seventy-two of them broke in the course of eighty

days. Another series of experiments was also made with cubes whose edges were 4.72 inches long. Five specimens of each mixture were prepared, three being allowed to harden in air and two in water, and measurements were made at two days, 4 days, 1 week, 2, 4, 6, 8 and 16 weeks after mixing. The mixtures embraced neat cement, mortar of 1 part cement to 3 parts sand, and mortar of 1 part cement to 5 parts sand.

The measurements varied considerably. In some cases the cubes of neat cement kept in air showed a shrinkage after four days and one week, while in others an expansion occurred; but in the course of the second week the expansions gradually disappeared, so that two weeks after mixing only one out of twenty-seven cubes exhibited a slight swelling, all the others having contracted. Four weeks after mixing, all the cubes kept in air had shrunk and continued to shrink slightly thereafter. In general the contraction is greatest for neat cement and appears to diminish as the proportion of sand is increased; but in several cases the addition of sand seemed to accelerate the shrinkage during the first four weeks. At the end of sixteen weeks the linear contraction of cubes of neat cement ranged from 0.12 to 0.34 per cent.; that of the one to three mortar cubes ranged from 0.08 to 0.15 per cent., and that of the one to five mortar cubes ranged from 0.08 to 0.14 per cent.

Of the cubes kept in water, some showed a slight shrinkage after four days and one week, while the others had expanded; after two weeks, most of them exhibited expansion, but a few still showed a slight shrinkage at the end of sixteen weeks. In general, there seemed to be a continuous expansion throughout the entire period of immersion, but in the last eight weeks the increment was very small, and in some of the mortars an appreciable contraction was observed. The expansion under water is always greatest and most regular with neat cement, but in proportion as sand is added, it diminishes and becomes irregular. At the end of sixteen weeks the linear expansion of the cubes of neat cement ranged from 0.01 to 0.15 per cent.; that of the one to three mortar cubes ranged from 0.00 to 0.02 per cent., and that of the one to five mortar cubes ranged from -0.03 to +0.02 per cent.

(To be continued.)



BERLIN—SPREE ISLAND—A SUGGESTION FOR NEW YORK

DETROIT'S WATER SUPPLY

A WATER WORKS SYSTEM with an unlimited supply of pure water; that serves practically every citizen, together with many of the suburban villages, at a low price and yet earns a profit, and which maintains a handsome park about the station is an institution of the city of Detroit.

The city draws its water from the Detroit River, which is the outlet for the upper Great Lakes, and there can, therefore, be no question of the supply ever becoming exhausted. All that is necessary is the power to draw it up and distribute it to the people, and the one fact that, in a city of 350,000 persons, but ninety-three families are not supplied with city water, attests the thoroughness with which the Commissioners past and present have done their work. And the people of more than a dozen surrounding villages are also supplied by the city system though at a cost somewhat higher than is charged within the city limits.

Among the interesting facts about the system it may be mentioned that the total amount of water pumped in the year ending June 30, 1904, was 21,734,000,000 gallons, or over ninety times the output of 1852, which was the first year of the plant. This amount gives an average daily per capita consumption of 183 gallons. The revenue derived from the sale of water is at the rate of \$0.0269 per 1,000 gallons when metered and \$0.017 when unmetered, the total being \$432,392.52.

There are three intakes from the river, the largest being six feet, which are supplied with strainer boxes; and a fourth, ten feet in diameter, will soon be completed. This last is a tunnel built of vitrified brick, and extending under the bed of the river a distance of 3,160 feet to the north end of Belle Isle, and will have sufficient capacity to meet the need of the city for many years to come. Bonds to the amount of \$350,000 were issued to meet the cost of the tunnel, the contract being let at \$34.40 per foot, and the crib house will cost \$75,000 additional.

The total cost of the maintenance of the plant for the year was \$159,397.91, which is increased by items for bond payments, interest charges and construction to a total expenditure of \$745,161.93. The total receipts, including the \$350,000 from the sale of bonds, were

\$945,738.61, leaving a surplus of \$200,576.68. The actual cost of pumping was \$72,835.98, and the cost of fuel for pumping one million gallons was \$1.76.

There is an outstanding bonded indebtedness on the plant of \$1,283,000. Prior to 1876 all the bonds issued



WATER COMMISSIONERS OF DETROIT

Darius D. Thorp, President	Joseph J. Crowley
Edw. W. Pendleton	
John Schroeder	John Zynda

bore interest at a rate of seven per cent., since then better terms have been secured and the interest charge at present averages about five per cent. The estimated valuation of the works is \$7,344,456.30.



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Civic Conditions in New York

MORE than the usual amount of space has been devoted to New York City in this issue, but after reading Mayor McClellan's article and a review of the work of the New York City Improvement Commission the reader will justify the innovation. The plates used in illustrating the work of the Improvement Commission are here reproduced by the courtesy of the Commission. The original drawings were made in water colors, and were, therefore, the more difficult to reproduce in half-tone, which will account for the rather clouded appearance of some of the cuts.

Not even in the days of the Reform administration was New York so thoroughly aroused over the domineering attitude of the various public corporations as at the present time. The gas, electric, telephone and transportation monopolies have trampled the public under foot for so long that, like the proverbial worm, it has turned. To the credit of Mayor McClellan it may be said that he is the leader in the endeavor to secure not only the rightful privileges of the public, but of the city as well. As a result of his co-operation the city, it is generally believed, will soon obtain a reduction in the exorbitant price of \$146 per arc lamp charged for street lighting, and a corresponding reduction for arc lamps of lesser candle power, and incandescent service. One of the ways by which he expects to bring the greedy corporation to terms is in the establishment of a municipal lighting plant located near the Manhattan end of the Williamsburg Bridge, which will produce enough power to light the bridge and many public schools in that vicinity. His ultimate purpose is to install power plants of sufficient capacity in suitable locations about Greater New York to furnish light for the entire city. His efforts in this direction are ably supplemented by the investigations conducted by Comptroller Grout and others, and there

is a likelihood that there will be a reduction in the price for gas illumination. A bill has been introduced in the State Legislature providing for an arbitrary reduction of the price of gas per thousand cubic feet from \$1 to 75 cents.

In no other city in the world are such exorbitant charges for telephone service to be found as in New York. In this city \$75 a year is charged for 600 calls on a direct wire, and 8 cents for each message over that number; for 800 calls, \$87; for 1,000 calls, \$99; for 5,000 calls \$243, and a charge of 3 cents for calls in excess of 2,000 above the allotted number. An unlimited service cannot be purchased. Any person desiring to use the telephone within the Borough of Manhattan has to pay 10 cents per call; if he wishes to call up a party in Brooklyn 5 cents is added. Only a short time ago the total charge for a call in Brooklyn was 20 cents, but it has recently been reduced to 15 cents. In other cities the Bell Company, because it has the competition of a rival company, gives a service at a much less price. For instance, in Rochester, where there are two companies, the Bell charge for an unlimited service per year is \$84, while that of the rival company is \$48. The Bell Company has 7,700 subscribers, and the rival company 5,700. In Pittsburg the Bell Company charge for unlimited service is \$125, while that of its rival is \$72. The Bell has 33,245 subscribers to 8,100 of its rival. In Cleveland the Bell Company charge is \$84 and that of its rival \$72, for unlimited service, while the subscribers number 18,000 and 14,500 respectively. In all these cities, and in most others throughout the country, a charge of only 5 cents is made for a call at any public station.

There is such general indignation over the exorbitant charges made by the telephone company that various organizations, assisted by a large number of individuals and business houses, are making an organized effort to secure the enactment of legislation that will permit the entrance into New York of a rival company in order that a liberal reduction in the prices now charged may be secured. If the end is not secured at this time it is sure to come sooner or later, for even New Yorkers will not submit to imposition always, although so far as corporate oppression is concerned they are meek and lamb-like in their obeisance to the powerful corporations, and will yield for long periods of time almost without a murmur to the most galling conditions.

There is trouble brewing also for the transportation companies. At present, transfers are only given out at a few points, whereas the law demands that they be given out at every intersecting point within the city limits. The Interborough Company has gotten into considerable trouble over the high-handed methods employed for placing advertisements in the Subway against the universal protests of the public and the newspapers. The Municipal Art Society, through its President, Mr. Calvin Tomkins, is the leader in this fight against the abuse of corporation privileges. Mr. Tomkins recently scored a victory in the case of the advertising signs placed on the fence surrounding the new library now building at Forty-second street, and Commissioner Pallas has been obliged to remove the signs and replace them with a coat of dark green paint. It is generally believed that when the matter of the Subway

signs is taken into the courts that the city will be able to have the signs removed. Another result may follow, and not to the liking of the transportation company, viz., that a decision on this point will reveal the fact that no transportation company operating lines within the city limits has the right to have display advertising in any of its cars even, and if the matter is tested to the end there is a likelihood that advertising signs may be taken out of all the street cars.

Commissioner of Police McAdoo is leading a strenuous life in an attempt to reorganize the Police Department, which became thoroughly disorganized under the Low administration. He is hampered too much by red tape, and is not given a free hand, otherwise the work would have been done months ago. He is the right man in the right place, and he is sure to leave the Police Department better than he found it.

All things considered, New York may be said to be in a much more *reformed* condition at the present time than during any part of the Low administration. Unfortunately for the Low administration, most of the time was spent in exploiting the ponderous thoughts of his honor and talk by his advisers. Very little time was given to action. The McClellan administration affords a sharp contrast. Mr. McClellan talks very little but acts a good deal. His administration thus far has met with the general approval of all classes of citizens, and the hope is expressed on every hand that he will succeed himself.

Municipal Socialism

MR. AUGUST BELMONT and many other corporation capitalists are using every means to bring municipal ownership and operation of all public utilities—such as lighting, water and transportation facilities—into disrepute. At a recent dinner of the Chicago Real Estate Board he is quoted as saying:

"Municipal *operation* of a transportation system is a mistaken policy. I do not object to municipal ownership. Indeed, I rather approve of it. But as to municipal *operation* of these utilities I consider it a mistake."

In commenting on the remarks of Mr. Belmont the New York *World* pertinently says:

"The movement in the direction of public ownership and operation of utilities is merely a symptom of long-standing corporation abuses. Cities are being driven into this business as a choice of evils.

"A decade ago practically all municipal lighting was done by private corporations. Excessive charges, poor service, fraudulent contracts and political corruption on the part of the lighting companies aroused so much resentment that certain cities made the experiment of establishing public lighting plants. The results have been sufficiently satisfactory to encourage other cities to do the same.

"In Chicago, where Mr. Belmont was speaking, there is a strong sentiment in favor of the city's owning and operating its street-railway lines. This question is the leading issue in local politics.

"The people are tired of the poor service, the high fares, the stolen franchises and the debauched Common Coun-

cils for which the street-car companies are responsible. They have seen the public franchises which they gave away capitalized for millions of dollars; they have seen the public-service corporations manipulated exclusively in the interests of promoters and stock gamblers, regardless of the people's rights. They have had to endure antiquated rolling stock, inadequate schedules and a demoralized service because companies that could earn big dividends on the actual investment were swamped in watered bonds and watered stock.

"New York has seen the same thing, and the Brooklyn Rapid-Transit Company furnishes one of the most shameless examples known to the country of high-finance looting of public rights.

"These are the abuses that are quickening the demand for municipal ownership and operation of public utilities. People are beginning to believe that any change is bound to be for the better. They are so sick of being robbed that they look kindly upon any expedient that offers even a shadowy promise of relief.

"If Mr. Belmont wishes to check the movement toward municipal operation of public utilities in New York he can do it in no better way than to give the people the kind of transportation service they want. He might begin by restoring the former service on the elevated roads. He should remember that every strap-hanger is likely to be an embryo Socialist."

Resignation of Deputy State Engineer

THE resignation of Mr. William Pierson Judson from the office of Deputy State Engineer is announced, to take effect on February 1. Mr. Judson has most acceptably filled the office of Deputy State Engineer for the last six years. In addition to his many other efficient duties he had the general charge of the system of highway construction by State aid, and has had general supervision of the work, making the final inspection and the acceptances of all the seven million dollars worth of roads built in New York State, he being a recognized authority on the subject. Mr. Judson resigns at the beginning of a new term because of the great increase of work which will be entailed by the provisions of the new law for highway maintenance, which puts the care of all the roads in the State, both new and old, under the State Engineer. This will so increase the already arduous duties of the deputy as to require that officer to spend almost all of his time in traveling by night and in going over the roads by day. This increase of duties would prevent Mr. Judson from giving any attention whatever to his considerable private interests, which are such that he decides to retire from the office of which the added duties will be more than he cares to undertake.

Mr. Judson is well known to the readers of THE MUNICIPAL JOURNAL by his book on "City Roads and Pavements," a revised edition of which was published last year. While it is to be regretted that he deems it wise to resign his position with the State Department of Highways, it is hoped that the public will gain thereby in the additional time he may spend upon the putting into permanent form the knowledge of road and street building he has acquired by many years of practical experience.

The N. B. M. A. Convention

THE National Brickmakers will meet in annual convention at Birmingham, Ala., on January 30, and the convention will close on February 11. Secretary Randall informs us that the Southern Passenger Association has authorized reduced rates to the convention on the basis of one and one-third fare, on the certificate plan, such as the Association has enjoyed in years past. It is expected that all other passenger associations will concur in this action, and that reduced rates may be obtained in all sections of the country. Headquarters will be located at the Hotel Hillman, which is a thoroughly modern, fire-proof, brick structure, finely appointed in every department, and at rates ranging from \$1.50 to \$3 per day, where two occupy the same room.

In connection with the National Brickmakers, will meet, as usual, the American Ceramic Society, whose work is devoted to the more technical and scientific discussion of methods of clay manufacture. This Association will meet Monday, Tuesday and Wednesday—January 30, 31, and February 1—while the brickmakers will meet during the afternoons of Wednesday, Thursday and Friday. It is planned to hold but one business session a day, thus leaving the forenoons open for visiting and inspecting brick yards and the examination of exhibits, social intercourse, etc. There will be exhibits of light machinery, models, specimen brick, trade literature, which will be installed in a large, well-lighted room directly across from the convention hall. Among the papers to be presented dealing with the paving brick question, are the following:

"Good Roads and the Part Vitrified Paving Brick May Play in the Work," by Col. R. W. Richardson, Omaha, Neb.; "What Are the Relative Merits of Cement and Asphalt Fillers for Brick Pavement?" "The Effect of the Sand-Lime and Sand-Cement Brick on the Building Brick-Market," as subjects for general discussion.

Birmingham is a beautiful city, and thoroughly up to date, and owns many miles of brick paved streets. It has a population of about 50,000. Mayor Drennen will be sure to see that the brickmakers have a good time while guests of his city.

Misstatements About Municipal Lighting

INCORRECT statements about the operation of municipal lighting plants are of frequent occurrence, so much so that it is hardly worth while to attempt to correct them. But the editor thought to do a service to the cause of municipal ownership by throwing light on a reported interview with Mayor Johnson of Cleveland, Ohio, in which his reported statement that the South Brooklyn, Ohio—a suburb of Cleveland—lighting plant was a success was not borne out by the facts. The clipping was sent to Mayor Johnson with a courteous request for the facts in the case. As Prof. Edward W. Bemis—the well known expert on municipal affairs—is the superintendent of the Cleveland water works, the Mayor very properly referred the question to him, who replied as follows:

"With regard to the South Brooklyn electric light plant, Mr. Johnson wishes me to say that, he has never made any statements about the profitableness of the plant. Neither have I looked the matter up. I know that the people of

South Brooklyn are so much pleased with it that they make it a condition of annexation that we shall continue to operate it and to extend it, and that is causing the private electric light company of this city to move heaven and earth to prevent annexation, if possible, for fear it will be an entering wedge for a municipal plant in Cleveland.

"I noticed recently the report of an audit company that claimed to give figures showing that the plant cost a good deal, but in order to bring about the result a 10 per cent. charge had been made for depreciation which, you will recognize, is a great exaggeration. On the other hand, a visit that I paid to the plant recently convinced me that its location was unfortunate; it being some distance from a railroad, while it ought to have been located—as it could have been—right beside a railroad. Fortunately, it would not be difficult to move the machinery to a proper location."

It often costs a city a trifle more per kilowatt to manufacture electric current, but ninety-nine times out of one hundred the municipality and the people obtain better service at a lower cost than under private ownership, while the plant more than pays for itself.

Smoke Prevention

A CRUSADE against smoke has been instituted in Minneapolis by the Real Estate Board of that city, and it proposes to accomplish a revolution in the burning of soft coal and other smoke producing fuels, peaceably if it can, forcibly if it must.

Since the recent Supreme Court decision in a St. Paul case, in which the right of a municipality to abate the smoke nuisance was clearly established, the Board has taken a fresh hold of the smoke problem and will wage a campaign of education and prosecution until every smoky building in town is reformed.

It is to be hoped that the Real Estate Board will receive the hearty co-operation of the city administration. Minneapolis might profitably follow the example of Cleveland and other cities and establish a smoke prevention bureau. The city should lead in the effort to correct all such nuisances.

The Care of Valuable Records

THREE years ago THE MUNICIPAL JOURNAL had a leading article about the city of Springfield, Mass., most of which was commendatory and justly so. But a few pressing needs of the city were pointed out, the most urgent being the immediate and adequate provision for the protection of the valuable records in the City Hall. Many of these were of historic value and most of them of such a character that they could not be replaced if destroyed by fire or otherwise.

The fire has occurred and the City Hall has been totally destroyed with many of its valuable records, some of which can never be replaced at any price. When a new city hall is built it is more than likely that it will be fitted throughout with fire-proof vaults and steel furniture, which will be better than to continue under old conditions.

The loss of the city records has had a salutary effect upon the county commissioners for they have taken warning from the disaster and at a recent meeting took final action

upon plans providing for the protection of county records. To this end a bill has been presented to the State Legislature authorizing the taking of land and the expenditure of a sum not to exceed \$200,000 for the erection of a fire-proof Hall of Records building in which the office of the registry of deeds, register of probate and probate court may be accommodated and the invaluable records of those offices preserved against damage or destruction by fire.

It is better to "lock the barn after the horse is stolen" than never to lock it at all, but it would have been wiser if Springfield had taken the advice of THE MUNICIPAL JOURNAL three years ago and placed its records where they could not be destroyed. Other municipalities will act wisely if they profit by Springfield's experience without waiting for a bitter one of their own. It is a foolish economy that undertakes to save either private or public funds by running such risks. In these days of fire-proof materials and furnishings it is worse than folly for municipalities to leave valuable records unprotected.

Personalities

—At the recent election held at Lake Helen, Fla., Mr. Erastus Hopkins was chosen mayor.

—Mr. W. D. Baillairge has been appointed city engineer of Quebec, Can., to succeed his father, who has resigned.

—Mr. Harrison Stidman has been appointed superintendent of street cleaning department of the District of Columbia.

—Mr. J. W. Kendrick, city engineer of Birmingham, Ala., has been elected president of the Engineering Association of the South.

—At the elections recently held in Georgia, Hon. Quitman Holton was elected mayor of Brookton, and Col. Oscar Brown, mayor of Homer.

—Mr. Walter G. Kirkpatrick has resigned as city engineer of Jackson, Miss., after having held office for seven years, to engage in private business.

—Hon. Thomas Urquhart was reelected to the mayoralty of Toronto, Can., on January 2 by the largest vote ever polled in the city. He nearly doubled his vote of 1904.

—The town of Winder, Ga., was exceptionally free from party disturbance at its last election as there was but one ticket, which was headed by Mr. J. T. Strange for mayor.

—On January 10, City Clerk Edgar W. Hassler, of Pittsburgh, Pa., died while on his way to his office of heart failure. Mr. Hassler was within a day of being forty-six years of age.

—Hon. Oliver Clifton, mayor of Jackson, Miss., died on January 1 of pneumonia, two hours after becoming mayor for the third time. He qualified for the office, while in bed, the day before his death.

—The mayor, Hon. George H. Williams, of Portland, Ore., has appointed Mr. Charles Wanzer city engineer, for the remaining six months of the unexpired term of Mr. W. C. Elliott, who has resigned.

—Among other experts who are helping Comptroller Grout, of New York City, in his investigation of the light-

ing question, is Charles E. Phelps, chief engineer of the Baltimore Electrical Commission.

—By the resignation of Mayor Nowrey, City Recorder O. Glen Stackhouse has become acting mayor of Camden, N. J. His first act was to sign the Water Department payroll which had been held up by the former mayor's resignation.

—Mayor H. H. Baker, of Winchester, Va., was recently tripped up by one of his own laws. He failed to have the ice and sleet removed from his sidewalk and was fined \$1 along with fifty other prominent citizens who failed to comply with the ordinance.

—As a result of recent elections in Mississippi, the following mayors took the reins of office at the first of the year: Hon. James V. Vunkannon, of Gunnison; Hon. R. D. Lanier, of Brookhaven, for the second time; and Hon. John W. Watsin, of Seminary.

—At the recent election held at North Adams, Mass., Mr. Marshall R. Ford was elected mayor by a small majority. It was generally predicted that former Mayor Stafford would be elected, but the results show that Mayor Ford was the more popular man.

—On the last day of last year the city officials of Salt Lake City, Utah, went, in a body, to Mayor Richard P. Morris' office and presented him with a beautiful cut glass punch bowl and glasses, silver ladle and tray, as a mark of the esteem which they all felt for him.

—Mr. John P. K. Otis died at his home in Worcester, Mass. on December 31, 1904. In 1880 he became manager of the Union Water Meter Company of Worcester, and in 1900 was also made president of the company, which position he held at the time of his death.

—The council of Kokomo, Ind., last month, presented a gold-headed cane to Mayor Macy A. Bronse. Mayor Bronse has arrived at the "gold-headed cane stage" considerably ahead of time for he is still a young man and can hardly be called a man of middle age.

—On January 7, the city council of Martinsville, Ind., elected James G. Bain, mayor of the city, to fill the office made vacant by the death of Hon. Harvey Baker. Mr. Bain was formerly a newspaper man and will have one year to serve as chief executive of Martinsville.

—Hon. G. Frank Cope is the first Republican mayor that Somers Point, N. J., has ever had. He took the oath of office and was duly installed on January 2. He was formerly proprietor of the Berkshire Inn and through his efforts it became one of the most popular of the smaller hotels.

—Mr. Alton D. Adams, the expert on the operating costs of gas and electric plants, late of Boston, is now located in the State Mutual building, Worcester, Mass. Mr. Adams makes a specialty of reports on the cost of gas and electric supply, and of expert work in the courts, on these matters.

—Mr. William Pierson Judson has resigned as deputy State engineer of New York because of the greatly increased work entailed by the provisions of the new law for highway maintenance, which puts all of the roads of the

State under the care of the State engineer and which will necessitate the deputy engineer to travel by night and inspect roads by day, most of the time.

—A duel took place recently between Mayor Olin Barnes and City Marshal Whitehead, of Hamilton, Ga. These two gentlemen met in the streets Tuesday night and at once commenced shooting at one another. Barnes fired once and Whitehead twice. The former was unhurt, but the latter received a painful wound in the hand. The trouble grew out of the recent arrest of a negro who was employed on the farm of Mayor Barnes.

—Hon. George H. Williams, mayor of Portland, Ore., was recently indicted by the county grand jury of Multnomah on a charge of malfeasance in office. On July 13, 1904, Mr. Williams, as mayor, refused to enforce the statutes regulating gambling and thus the indictment. Chief of Police Charles H. Hunt was indicted at the same time for the same cause. Later, on the motion of District Attorney Manning, both indictments were dismissed by State Circuit Judge A. L. Frazer. Mr. Manning also asked that the records show that Mayor Williams be fully exonerated of any offence charged in the indictment.

Convention Dates

February

—National Brickmakers' Association will meet for its nineteenth annual convention at Birmingham, Ala., January 30 to February 11, 1905. T. S. Randall, secretary, Indianapolis, Ind.

March

—The International Society of States and Municipal Building Commissioners and Inspectors will meet at Washington, D. C., March 2-4, 1905. F. W. Fitzpatrick, secretary, 1431 Welling place, Washington, D. C.

October

—American Society of Municipal Improvements will meet at Montreal, Can., some time in 1905. George W. Tillson, C. E., secretary, Municipal building, Brooklyn, N. Y.

—The League of American Municipalities will meet at Toledo, O., in 1905. Hon. John MacVicar, secretary, Des Moines, Ia.

American Society of Municipal Improvements

A. PRESCOTT FOLWELL, President, Easton, Pa.
GEORGE W. TILLSON, Secretary, Municipal Building, Brooklyn, N. Y.

THE next meeting of this society will be held at Montreal on September 5th, 6th and 7th, 1905. This will be the second meeting held in Canada, the first having been at Toronto in 1899.

The Montreal officials have been trying for a number of years to obtain this meeting, and would probably have been successful in 1904 had it not been for the St. Louis Fair, its attractions being too strong for any other city to cope with.

Canadian hospitality is well known to all who have experienced it, and everyone attending the meeting can be assured of a good time socially, and even now the success of the meeting technically is guaranteed.

The officials of the society are much encouraged at the large number of members who will be proposed for election at the Montreal meeting.

This is a matter that should be considered a personal one by every City Engineer, or other official who is interested in any way in the local government or public improvements. There is no better way for one to get in touch with what is going on in his line in other cities than by attending these meetings and coming in personal contact with officials of these cities. One can read technical journals and become well informed in general, but the little, though important, details can only be obtained from the people who have personally worked out these details. This society is made up largely of men who for years have been engaged in their particular work, and whose experience is valuable.

It may be of interest to state how the society itself keeps posted. A member of a committee reads in the technical press that a certain city has accomplished something in his line of work that is new and unique. He immediately writes to the official in charge of the work for further information, and this generally results in a paper being prepared for the society, giving in details just what has been done. In this way it is possible to keep informed as to just what new methods and processes are being used in cities other than one's own. Is not this desirable? Is it not practicable? Is there any other way in which an official can keep so thoroughly in touch with what other people are doing about work in which he is interested?

For example, during the last year or two much has been said about the advisability of municipalities constructing an asphalt plant and making their own repairs. The city of Winnipeg, Manitoba, has been laying new asphalt pavements with its own plant, and with its own labor, for some years. The Committee on Street Paving secured a paper on this subject from Mr. H. N. Ruttan, City Engineer of Winnipeg, with the result that the proceedings of the St. Louis meeting that will be issued in a few weeks, will contain exact and detailed data on this subject, such as has never been published before.

The different committees report on practically all matters that come before a municipal legislature, so every field is covered, and an official is almost sure to find something of special interest to him.

The Committee on Review collects the reports of the different cities for the previous year, and submits to the society as its report a résumé of everything that is new or novel in any of them.

The membership of the society has been made up until recently wholly of officials from American cities, but last fall an application for membership was received from Mr. Ulrich E. Taubenheim of Archangel, Russia, and it has since been determined to place no restriction upon membership. Mr. Taubenheim is general manager of the water works of Archangel, and his application resulted from his seeing a copy of the proceedings.

Meeting of Iowa Engineering Society*

THE seventh annual meeting of the Iowa Engineering Society convened in the Auditorium of the Liberal Arts Building of the State University of Iowa, at Iowa City at 2 P. M., Wednesday, January 11. Addresses of welcome were given on behalf of the city by the mayor, F. K. Stebbins, and on behalf of the State University by President George E. MacLean. Responses were made by L. H. Stone and Prof. A. Marston. Papers were read by L. E. Ashbaugh on "Topographical Survey of Meandered Lake Beds"; by George M. Thompson, on "Assessing Cost in Drainage Districts"; by J. J. Ryan, on "Rebuilding the Muscatine Water Works"; by J. M. Brown, Engineer in charge of Construction, on "C. R. I. & P. R. R. Shops at Moline, Illinois," illustrated by photographs showing progress of the work.

mittee on Surveying and Drainage," by Seth Dean, brought out a discussion of the new drainage laws of Iowa. "Report of the Committee on Sanitary Engineering," by Prof. C. S. Magowan, was supplemented by a paper on "Inaugurating Sewer Work and some Defects in the Iowa Sewer Laws," by Chas. P. Chase; "Track Division on C. B. & Q. R. R.," by W. L. Breckenridge; "The Bacteriological Examination of Water as it Concerns the Sanitary Engineer," by Dr. Henry Albert, was illustrated by charts and an exhibit of apparatus.

Thursday, 2 P. M.—The Society made a trip of inspection to Cedar Rapids over the Cedar Rapids and Iowa City Electric Railway in a special car furnished by the officials of the road.

Thursday, 7:30 P. M.—Papers, "Sewerage System of Des Moines," by L. H. Stone; "Municipal Engineering for



DETROIT'S PUMPING STATION—(See page 73)

Wednesday, 7:03 P. M.—"Report of the Committee on Railroad Engineering," by J. D. Wardle; "Report of the Committee on Roads and Pavements," by Prof. A. Marston, outlining the work of the Highway Commission at the Iowa State College. This report was discussed at length, the principal point being in regard to the proper binding material for macadam roads. The papers of the evening were, "Capacity of Flowing Streams for Power without Storage," Prof. William G. Raymond, illustrated by lantern slide diagrams, and "Power of Running Streams as affected by Flood," by Prof. Sherman M. Woodward.

Thursday, January 12, 9 A. M.—"Report of the Com-

Small Towns," by R. B. Slippy; "Water Problem in a City of 18,000 People," by C. T. Wilson; "The Marshalltown Reservoir," by C. A. Baughman; "Cement and Concrete Construction," by Chas. P. Chase, being hints on the subject suggested by practice; "Iowa Avenue Culvert, Iowa City," a piece of reinforced concrete construction, illustrated by lantern slides, by Prof. C. S. Magowan.

Friday, Jan. 13, 9 A. M.—Papers, "Concrete Dam at Manchester, Iowa," by B. J. Lambert; "Concrete Steel Bridge, Kankakee, Illinois," by J. B. Marsh; "Notes on Cost of Relaying Brick Pavement with Cement Filler," by C. A. Baughman. A general discussion of the comparative merits of cement-filler and sand filler followed; "Land Surveys," by C. R. Allen. Reports of committees were given by Prof. G. W. Bissell on "Mechanical Engineering";

* Reported by Arthur J. Cox, Sec.-Treas, Iowa Engineering Society, Iowa City, Ia.

Prof. L. B. Spinney, on "Electrical Engineering"; Chas. P. Chase, on "Iowa Elevations." The latter committee is endeavoring to get all levels in the State referred to the same datum.

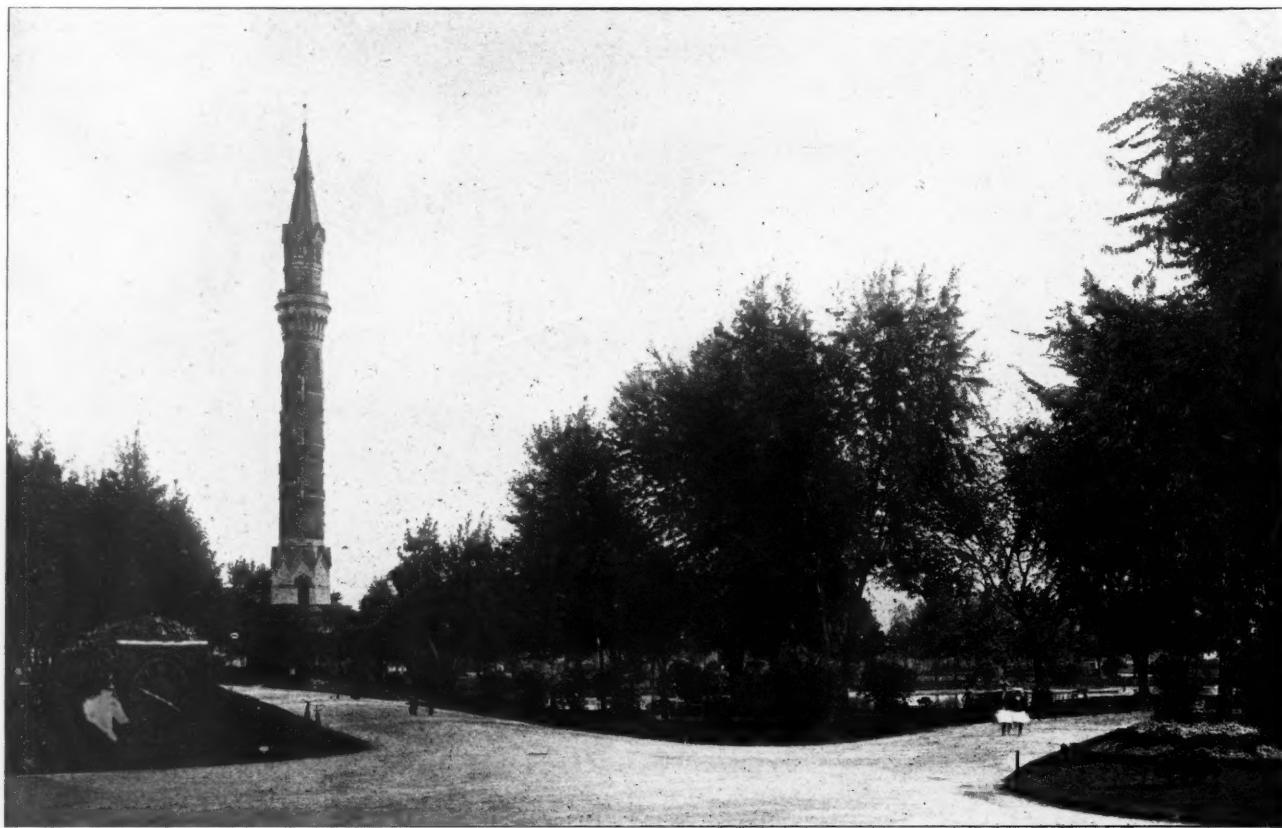
Friday, 1:30 P. M.—"Report of Committee on Special Legislation," by Arthur J. Cox, showed that the committee had succeeded in getting the last legislature to pass a bill enabling towns and cities of the second class to vote double the amount that they could formerly vote for the construction of water works and sewers. The report of the secretary and treasurer, Arthur J. Cox, gave the membership of the society as ninety, with ten applications for membership on file, a growth of twenty-five during the last year, with a cash balance of \$105.62 in the treasury.

Election of officers resulted as follows: President, J. D. Wardle, Cedar Rapids; vice-president, L. E. Ashbaugh,

ly beyond the city limits to other municipalities, but to East Omaha which is outside of the State: whether the city should pay a "going value," or a bonus for good-will when the franchise is limited to twenty years, which period has about expired, and whether the actual value of the bonds of the company do not indicate the value of its property. Over 2,000 pages of evidence have been taken by the commissioners and must be considered by them before they make their final appraisal.

Larger Water Supply for New York

THE Commission, consisting of William H. Burr, Rudolph Herring and John R. Freeman, appointed by Mayor McClellan to investigate the question of additional water supply for the city of New York and report on the



PUMPING STATION PARK, DETROIT WATER WORKS—(See page 73)

Ames; secretary-treasurer, B. J. Lambert, Iowa City; directors, W. H. Jackson, Des Moines, and Arthur J. Cox, Iowa City.

Omaha to Have Municipal Water Works

OMAHA, NEB., is to have municipal water works, but not without learning that public contracts must be most carefully drawn and most rigidly adhered to. By the terms of the franchise of the local company, which is about to expire by limitation, the city has the right to purchase the plant at an appraisal by a duly constituted board of arbitration. The company insists on \$7,840,000, and the City Engineer estimates the plant worth but \$3,172,750. The questions at issue in the appraisal are whether the city must and whether it can buy the entire system which extends, not on

most available sources from which to draw the water required, states that, in view of the grave danger of a water famine, additional water should be obtained in the shortest possible time, and recommends that a cut aqueduct be built from Esopus to the reservoirs of the Croton watershed, and that a new reservoir at Cross River, and one near Croton Falls be built immediately.

The plan suggested could be completed in from five to eight years, and would afford an additional supply of 300,000,000 gallons daily. The two reservoirs would cost about \$4,000,000, and the 58 miles of aqueduct, at the rate of \$500,000 per mile, which the present aqueduct cost, would make the expense \$29,000,000 more. There would be 18 miles of steel pipe, 5 miles of tunnel and 35 miles of cut cover aqueduct.

Competitive Investigation of Hydraulic Cements

NOTWITHSTANDING all that has been done by institutions like the royal testing establishment at Charlottenburg, by architects' and builders' associations, and by the Governments of Switzerland, France, and Belgium, to test the hardening and durability of hydraulic cements under varying conditions of moisture and exposure to heat and frost, there is still a margin of uncertainty in respect to certain of these properties, concerning which authorities and recorded experience seem to disagree.

What is, after all, the combination which really takes place between the silici acid, alumina, and oxide of iron when mixed with lime, and in what manner and degree do these several substances contribute to the hardening of hydraulic cement under certain prescribed conditions? Conceding that certain known results are produced by the mingling of these elements, what chemical or mechanical action takes place, and how shall such action be exactly

language, each signed with a pseudonym, and the name of the author inclosed in a sealed envelope marked with the same pseudonym, which latter will be opened only in case the paper bearing such pseudonym receives a prize. Thus prepared, all papers for competition are to be addressed to the "Ministry of Public Works, No. 80 Wilhelm-Strasse, Berlin," where they will be received until 3 P. M., December 31, 1906.

The best work of the foremost scientists throughout the world is cordially invited, and the papers, immediately after the lists are closed, will be submitted to a jury composed as follows: Prof. Dr. Van Hoff, Berlin; Prof. Dr. Scheibe, Wilmersdorf; Dr. Michaelis, Berlin; E. Cramer, editor of the *Clay Industry Journal*, Berlin; Prof. Dr. Wilhelm Fresenius, Wiesbaden; Director Friedrich Schott, Heidelberg; Dr. H. Passow, Hamburg, and officials of the royal testing station near Berlin.

The scope of the investigation is indicated by the fol-



BIRDSEYE VIEW SETTLING BASIN, CANAL AND LIBRARY, DETROIT WATER WORKS—(See page 73)

and scientifically stated and described? Most builders and engineers who make large use of hydraulic cement in various constructions feel the want of more thorough and exact theoretical knowledge on this subject, and to meet this demand the German Government, with characteristic thoroughness and forethought, has adopted a plan for collecting what is known on the whole complicated subject by the foremost experts of Germany and other countries.

In June last the Prussian minister of public works, jointly with the Prussian ministers of war, agriculture, and trade and industry, the imperial secretary of the navy, and the German society of Portland cement manufacturers, issued a call for a prize competition of scientific essays on the chemical processes which take place during the hardening of hydraulic cements. Prizes to the amount of 15,000 marks (\$3,570) are offered, and the prospectus specifies that contributions must be submitted in the German

language, each signed with a pseudonym, and the name of the author inclosed in a sealed envelope marked with the same pseudonym, which latter will be opened only in case the paper bearing such pseudonym receives a prize. Thus prepared, all papers for competition are to be addressed to the "Ministry of Public Works, No. 80 Wilhelm-Strasse, Berlin," where they will be received until 3 P. M., December 31, 1906.

The best work of the foremost scientists throughout the world is cordially invited, and the papers, immediately after the lists are closed, will be submitted to a jury composed as follows: Prof. Dr. Van Hoff, Berlin; Prof. Dr. Scheibe, Wilmersdorf; Dr. Michaelis, Berlin; E. Cramer, editor of the *Clay Industry Journal*, Berlin; Prof. Dr. Wilhelm Fresenius, Wiesbaden; Director Friedrich Schott, Heidelberg; Dr. H. Passow, Hamburg, and officials of the royal testing station near Berlin.

The scope of the investigation is indicated by the following translation of the schedule which defines the questions to be solved:

Demonstration of the properties and of the hardening process of calcareous hydraulic cements, synthetically, analytically, microscopically, mineralogically (hardening in air, fresh water, and sea water).

(a) To prove whether silicic acid, alumina, and oxide of iron combine with lime as crystalloids in stable proportions, or as colloids in varying proportions.

(b) To prove whether double combinations result between silicic acid, alumina, and oxide of iron with lime and in what manner these substances are engaged in the hardening process.

(c) Consideration of the swelling phenomenon which accompanies the hydraulic hardening.

(d) Consideration of the influence of the temperature

and length of time of the burning process on the different kinds of hydraulic cements.

(e) Properties of puzzolana and its hardening with lime; beginning with silicic acid as the most active and prevailing puzzolana, alumina, oxide of iron, and manganese, independent and in combination with silicic acid, as natural or artificial puzzolana.

The competitors may choose for the purpose of investigation any or all of the foregoing questions.

This whole scheme is an apt illustration of the intelligent, economical, and rational way in which the Government of Germany aids in bringing to the assistance of various industries the attainments of scientific research and practical experience. It is to be hoped that American scientists will not fail to contribute some thing of note and value to this competition. No nation is more deeply in-

city, for which an annual license fee of 50 cents is charged. As a penalty for non-compliance with this provision a fine of not less than \$10 nor more than \$50 per day, for each day this section may be violated, shall be imposed.

Section 2, provides that not more than fifty pounds of gunpowder, twenty-five pounds of giant powder and twenty-five pounds of dynamite shall be kept by any one firm at any one time, within the corporate limits of the city; it is further provided that not more than ten pounds of gunpowder in tin cannisters shall be kept within the store or ware-room, while all giant powder and dynamite must be stored and kept in a metal magazine which shall be labeled on the tops, sides and ends, in large white letters, "Powder and Dynamite," and shall be located without the building and off the street or alley and in some vacant place where it will be securely fenced in and protected from danger, runaway



WATER WORKS PARK, LOOKING TOWARDS HURLBUT GATE, DETROIT WATER WORKS—(See page 73)

terested than the United States in the conclusions to which these researches may lead and which will become, from the moment of their publication, the common property of builders and engineers of all nationalities.—Consular Reports.

Regulations for Sale and Storage of Explosives

AMERICAN municipalities are beginning to give more careful attention to the regulation of the storage and sale of gunpowder, dynamite and other high explosives, within corporate limits. The provisions of an ordinance passed last December by the city of Knoxville, Tenn., for the above purpose, are as follows:

Section 1, requires every firm dealing in high explosives of any kind to procure a license from the recorder of the

teams and falling timbers or walls. Violation of the provisions of Section 2 shall be punishable by a fine of not less than \$25 nor more than \$50 per day for each day this section has been so violated.

Section 3, provides that nitro-glycerine kept within the limits of the city shall be confined in an iron cylinder, securely capped, and not more than twenty-five pounds shall be carried at any one time, and shall be stored in the same manner as provided for dynamite in Section 2. All violations of the provisions of this section are punishable by the same fine as imposed in Section 2.

Section 4, provides that every license under this ordinance shall be required to place and keep a sign in a conspicuous place, as follows: "Licensed to sell Powder and Dynamite." The fines for the violation of this section shall be

not less than \$10 nor more than \$50 for each day the section may be so violated.

Section 5, provides that no person or firm may deal in or give away or keep in store or stock any rocket, cracker, squib or other combustible fireworks, within the corporate limits of the city. This section shall not be so construed as to prevent the keeping in stock and prevent the sale of matches or small percussion caps when kept in tin or metal boxes with closed lids. The violations of this section are punishable by a fine of not less than \$25 nor more than \$50 for each offense.

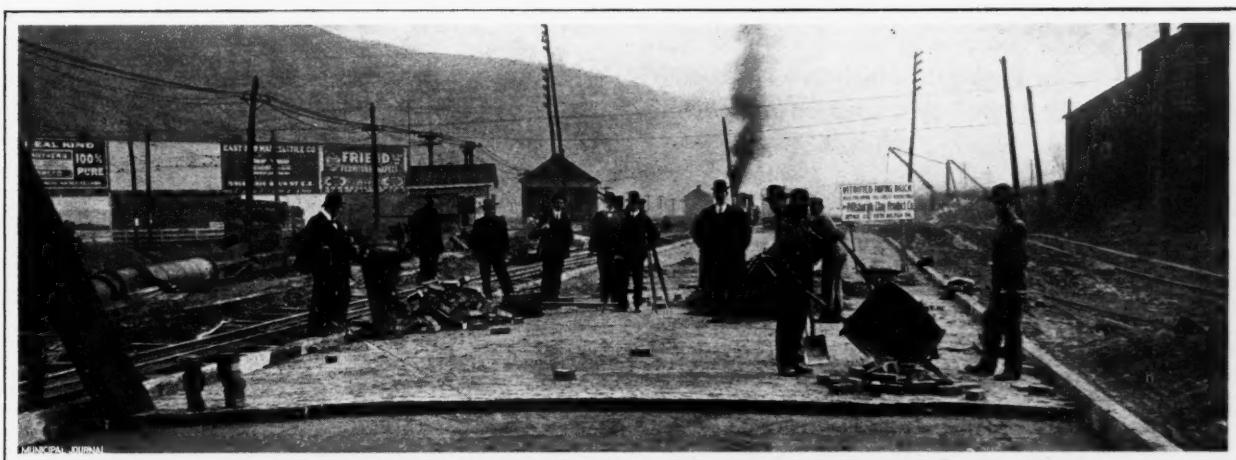
Section 6, makes it the duty of the Chief of Police at least once in every thirty days, and oftener if deemed necessary, to inspect all places where gunpowder, giant powder, dynamite or other high explosives are stored or kept for sale within the city limits, and to submit a report of these inspections to the Board of Public Works. If a greater quantity than that permitted is found it shall be declared a nuisance by the recorder and confiscated to the use of the city, and the offender shall be fined not less than \$10 nor more than \$50 for each day the provisions of this section may have been violated.

Company, of Pittsburg, at work on this street. This thoroughfare runs through the Borough of Hayes to the Pennsylvania Railroad, and also connects with a street from Homestead, over which there is much heavy hauling. The Borough Engineer had this pavement laid on a bed of gravel, thoroughly rolled, twelve inches in thickness. Upon this was placed a sand cushion two inches thick, upon which lay a single layer of brick four inches thick, the brick numbering forty-eight to the square yard. The cost of construction was \$2.10 per square yard.

Needed Chicago Street Improvements

THE city administration of Chicago has in recent years been exceedingly neglectful of the repairs necessary to keep the pavements in good condition, and there are now hundreds of miles of work to be done to put the streets in good condition, and the necessary expense is estimated at more than one million dollars.

The extent of the wornout pavements is unknown, but from a report of Commissioner Blocki, made to the Council,



BRICK PAVEMENTS IN THE BOROUGH OF HAYES, PA.—BUILT WITH BRICK MADE BY THE FEDERAL CLAY PRODUCTS COMPANY, PITTSBURG, PA.

Brick Pavements in Hayes

SINCE the first brick pavement was laid, in 1873, the work of improving the methods employed in its construction has been steadily carried forward. While an almost perfect pavement may be constructed with brick, provided the specifications adopted by the National Brick Manufacturers' Association are followed closely, yet city engineers and contractors throughout the United States are experimenting all the time and endeavoring to improve even this perfect form of pavement. Most cities use one layer of brick, while Topeka and a few others lay two courses of brick on a sand foundation. The writer has seen a pavement in a western city on a business street that was laid with one course of brick, and on a sand foundation only. It had held up a heavy traffic for nearly twelve years, and was in good condition at the end of that period.

The Borough of Hayes, Pa., recently laid a brick pavement, using a brick manufactured by the Federal Clay Products Company, of Pittsburg, Pa. The accompanying illustration shows the contractors, the Drake-Stratton

including the repairs necessary on pavements on which the guarantee has expired and will expire in 1905, there is a mileage of 556.93, without including repairs on other streets.

It is estimated that, at the present rate, it will require six years to put these streets in proper condition, and that by that time there will have accumulated twice as much more work to be done.

A comparison of the amounts expended for street repairs for the past few years indicates a wanton disregard of the taxpayers interest on the part of the city government. In the last year of the Swift administration there was expended to repair pavements \$196,306, and in the first year of the Harrison administration \$196,419 was appropriated. Since then the annual expenditure has decreased, as follows: 1899, \$102,023; 1900, \$113,569; 1901, \$78,344; 1902, \$52,245; 1903, \$30,676; 1904, \$28,500.

It is stated that had the repairs been made as needed the cost would have been not more than one-half of the outlay made necessary by this continued neglect, or, in other words,

the taxpayers must pay over half a million dollars for the ill-judged economy of the administration.

The official figures of the amount of pavement necessary calls for a total of 716,110 square yards of cedar block at a cost of 80 cents; 68,271 square yards of granite block at \$1.50; 29.963½ square yards of asphalt at \$2.50; 9.566½ square yards of brick with concrete at \$2.50; 308,501½ square yards of macadam at 60 cents, and 1,300 square yards of crushed macadam at 90 cents.

For the cedar the mileage is 266.50; granite, 21.18; asphalt, 56.00; brick, 22.25; macadam, 191, making a total of 556.93 miles, and the total cost, \$1,003,590.40.

Superintendent of Streets, M. J. Doherty, says in his report that "knowing the financial condition of the city" he asks for an appropriation of little more than 10 per cent. of the estimate total, to be used for the repair of asphalt, \$60,000; repair of macadam, \$35,000; repair of brick, \$5,000; repair of cedar block, \$15,000, and repair of macadam, \$3,500, making a total of \$150,000, which it will be noted is still \$46,000 below the annual appropriation of a decade ago.

Brick Pavements in Hornellsville

ALTHOUGH there are fifteen hundred miles of streets in American cities and towns paved with brick, the industry may be said to be in its infancy. Since the first brick pavement was laid in 1873 this kind of paving has grown in favor, and with comparatively little effort to advertise its merits. In the same year the first asphalt pavement was laid, and its promoters have expended many thousands of dollars in newspaper and trade advertising. In fact, every available means has been used to secure the adoption of

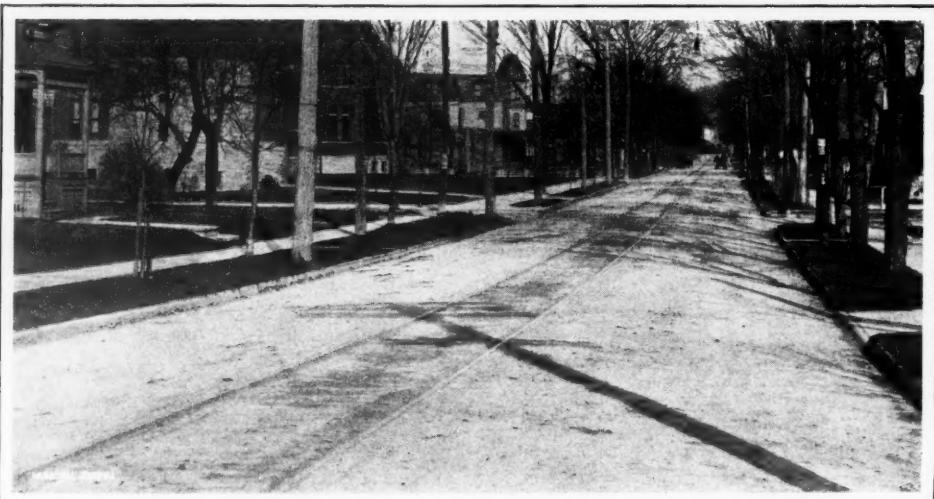
SENECA STREET, HORNELLSVILLE, N. Y., PAVED WITH BRICK IN 1894, MADE BY PRESTON BRICK COMPANY OF THAT CITY

this sort of pavement, with the result that 5,000 miles of asphalted streets are now in use. Had the same amount of money and energy been used to advertise brick pavement it is more than likely that instead of fifteen hundred miles of brick streets there would now be more than four times that amount.

Naturally, since the first brick pavement was laid there has been great improvement in the construction methods. For instance, little attention was given to the foundation at first, and the question of the best kind of filler to be used was ignored. The experience of brickmakers and city engineers has evolved methods of construction, which to-day are almost perfect. The general practice calls for a well prepared sub-base, a six- or eight-inch concrete base, carefully selected bricks and a cement grout filler mixed in the proportions named in the regulations fixed by the National Brick Manufacturers' Association. These methods have repeatedly been given in the MUNICIPAL JOURNAL.

Too great emphasis cannot be placed on the necessity for the utmost care in the construction of a brick pavement. It has often been said that a brick pavement well constructed out of poor brick will last longer than the same pavement poorly constructed out of the best brick.

The first brick pavement was made with building brick that had been slightly overburned. This was in 1873. Since that date paving brick manufacturers have rapidly multiplied. There are to-day, including the smallest concerns, nearly a hundred paving brick manufacturers in the United States. The largest output of any one plant is a little less than one hundred million bricks per year, and the smallest has about two million bricks per year. Somewhere between these two extremes will be found the Preston Brick Company, of Hornellsville, N. Y. Most of the bricks made by this concern are used in New York State, but a portion of the



SENECA STREET, HORNELLSVILLE, N. Y., PAVED WITH BRICK IN 1894, MADE BY PRESTON BRICK COMPANY OF THAT CITY



MAIN STREET, HORNELLSVILLE, N. Y., PAVED WITH BRICK IN 1893, MADE BY PRESTON BRICK COMPANY OF THAT CITY

output is shipped into other States. Cities which have used this make of brick have nothing but words of commendation for its wearing qualities. The accompanying illustrations show two streets in the city of Hornellsville, N. Y. Main street was paved with Preston brick in 1893. The pavement is in first-class condition to-day, and very little has been expended upon repairs since it was first laid. The pavement on Seneca street was laid a year later, and is in first class condition. These pavements sustain the heaviest traffic in the city, and while street car tracks run through them both, they are in almost as good condition to-day as when first laid.

Proposed Water Supply for Salt Lake City

THE problem of water supply for Salt Lake City is one calling for original solution on account of the peculiar situation of the city. The present supply is derived from City creek, Emigration creek, Parley's creek and Utah Lake reservoir, all together yielding a minimum daily supply of 53,600,000 gallons, but of this total only the creek water, amounting to 10,000,000 gallons is potable, the remaining portion being suitable only for irrigation and kindred uses.

It is desired to establish a system which will supply 300 gallons daily per capita for a population of double the present, or, in round figures, 40,000,000 gallons daily of water fit for drinking purposes.

The present distribution system comprises four districts: the lower and the upper, both supplied with commingled waters; the Thirteenth street and the Capitol Hill districts supplied exclusively with creek water. The Utah Lake reservoir water is brought into the city through an open channel and is used for irrigation partly by farmers in exchange for their rights to Parley's creek, and partly through the irrigation ditches which ramify the city. The creek water comes from canyons and is distributed by gravity.

There are other mountain creeks available for use; Mill creek and Big Cottonwood and Little Cottonwood creeks, with a minimum supply of 32,000,000 gallons daily, but to control these arrangements must be made with farmers for whom they supply irrigation, and it is proposed for the city to acquire the right to the use of the water from these mountain streams by the payment of a bonus of \$10 per acre to the farmers, and to give them an additional quantity—amounting to 25 per cent. of water from the canal during the irrigation season.

The expense of the improved system, including the riparian leases, conduits and distribution system is estimated at \$850,000, and it is estimated that the return from rents will pay the interest on the bonds and make a sinking fund for their final retirement.

The city could not, under the present law, bond itself in sufficient amount to buy the several streams, but it can arrange for perpetual leases, and, of course, the earlier this step is taken the less will be the cost.

In connection with the increased water supply a proposition for sewerage extension, involving an expense of \$150,000, will be submitted.

"The success of the plan," says Mayor Richard P. Morris,

in an address to the public, "means a greater Salt Lake, a larger and richer city—the permanent solution of a problem that has impeded the growth and progress of our city for many years; one that now threatens to halt its expansion altogether unless it shall be satisfactorily disposed of. The means of solution are finally at hand. It remains only for the taxpayers to ratify them. That done the future of Salt Lake City will be assured."

Indexing Public Improvements

PUBLIC improvements are card indexed by the City of Rochester, N. Y., in the manner shown in our cut. The character of the sidewalk and curb, length, cost, number of

Reynolds Street

Sidewalk Cement curb 4" Medina grading from Flint to Bartlett Street.
Character Portland Cement
Width of grading 50 feet Roadway 26 feet. width 5 feet.
Length 1682.4 feet cost 2761.14
No. of Ord 7703. contractor William Fuller
Date of completion Sept 14th 1899 Meas by C.L. Raymond
Ward New 19th old 8th Inspector B.F. Bryant
Book 1899 page 80.

(Color of card Yellow.)

Reynolds Street

Sewer 18-12 and 9 inch character Vitrified Pipe from Flint to Bartlett Street.
length 657.5 depth bel surf. 8 1/2 to 10 feet
cost 2761.14 date of completion September 14th 1899.
Ward New 19th old 8th
No. of Ord 7703 contractor William Fuller.
Assessible area See Final Ordinance No. 7703.
Measured by C.L. Raymond Inspector B.F. Bryant.
Book 1899 page 80.

(Color of card Salmon.)

Reynolds Street

Pavement Trap Rock Mac Adam character 10" Telford foundation from Flint to Bartlett Street.
width bet curbs 26 feet width of walk 5 feet.
length 1010 feet width of street 50 feet.
cost 2761.14 date of completion September 14th 1899
No. of Ord 7703 contractor William Fuller.
Ward New 19th old 8th
Measured by C.L. Raymond Inspector B.F. Bryant
Book 1899 page 80

(Color of card Blue.)

CARDS SHOWING SYSTEM USED IN INDEXING PUBLIC IMPROVEMENTS

ordinance, contractor, date and items of inspection are kept on a yellow card. The data regarding sewers are on a salmon-colored card, and those in reference to pavements on a blue card. This system commends itself for convenience in filing and ready reference.

INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told--Short Record of Happenings and Facts in City, Town and Village

THE COST OF ASPHALT REPAIRS in the city of Scranton, Pa., was determined by a contract entered into with the Barber Asphalt Paving Company, in 1898, to run ten years, whereby the city was to pay the company \$17,520 per annum for resurfacing worn out and cut pavements. The amount of such work done by company during 1903 was 8,963.60 square yards, which was at a rate of \$1.955 per square yard.

CLEANING THE PAVEMENTS OF SCRANTON, Pa., for the year ended December 31, 1903, was done at an average cost of 32 cents per thousand square yards; 7,812 cubic yards of dirt was removed. From March 20 to October 30, 13,679.372 square yards of pavement were flushed at an average cost of \$0.23 per thousand square yards.

THE PROFITS OF THE RICHMOND, VA., GAS WORKS for the year of 1902 were \$52,052.82. The consumption was 296,984.181 cubic feet, which was an increase over the preceding year of 26,286,348 cubic feet. The city has owned and operated the plant for fifty-two years, and deducting the original cost, cost of extensions, repairs, interest on capital, and total expense of maintenance there remains a net profit to the credit of the plant of \$767,501.90.

AMOUNT AND COST OF PAVEMENTS IN TROY.—The report of City Engineer, John Flynn, Jr., of Troy, N. Y., for 1903, shows the number of square yards of pavement laid during the year and the cost as follows: 12,621 of brick at from \$2.11 to \$2.45; 6,326.6 of granite at from \$2.65 to \$3.25; 787.7 of asphalt, on nine-inch concrete, at \$2.90, and 905.9 on six-inch concrete at \$2.80; 2,054 of asphalt resurfaced at \$1.83; 2,289 of grading at 65 cents; 12,970.0 linear feet of new curb, cost from 80 cents to \$1.25, and resetting 1,177.7 feet of old curb, cost from 38 cents to 40 cents.

BRIDGEPORT, CONN., CONTRACTS FOR STREET LIGHTS and pays the Welsbach Company \$30.00 per year for 80 candle-power lamps, which must be maintained by the company and burned from dusk to dawn every night. For electric lights of a nominal 1,200 candle-power it pays the local company \$83.00 per lamp on an all night and every night schedule. There are 433 Welsbach and 508 electric lamps used, and the total expense of street lighting for 1903-4 was \$54,825.98.

A CITY FOR SALE is a proposition that beats the abandoned farms of New England. Several years ago a young woman obtained judgment against Michigan City, Ind., for \$9,000 for falling on a defective sidewalk, the award has been confirmed by the Supreme Court of the State, but the sheriff returned the execution unsatisfied, as he could find no property on which he could make a levy. Now the sheriff has been ordered to sell the city to the highest bidder if the judgment is not paid.

PROVIDENCE, R. I., WATER WORKS FIGURES for the year 1902 show that the net cost of water works construction

from November 8, 1869, to January 1, 1903, is \$6,496,966.27, upon which there has been a revenue for water sold of \$10,617,340.39. For the year 1902, and for a city and suburban population of 198,400, the number of service pipes in use is 22,758; the average daily use of water per service for the year was 508 gallons; the average daily use of water per capita for the year was fifty-eight gallons; the water receipts were \$605,307.35, and the net cost of maintenance \$134,104.04.

CEDAR RAPIDS, IA., MUNICIPAL WATER WORKS ended its first year of operation with June 30, 1904, and the report of the trustees is very satisfactory. The plant was purchased at \$473,000, which amount has been reduced by payment of \$58,000; all operating expenses have been paid; interest on the bonds has been met; betterment of the plant amounting to \$11,000 have been made, and the rates to consumers reduced 15 per cent. The future payments on the bonds will amount to \$20,000 annually, while the water for hydrant rentals, sewer flushing, sprinkling, and water for public buildings, when purchased from the private company, cost more than \$25,000 a year.

COST OF LAYING WATER PIPES.—A table of 1902 prices is here given from the report of the city engineer of Providence, R. I. The approximate cost of laying ordinary water pipes, with appurtenances, except hydrants, and including iron at \$35 per long ton is, per foot is:

For 4-in.....	\$0.556	For 16-in.....	\$2,730
" 6-in.....	0.815	" 20-in.....	3.817
" 8-in.....	1.098	" 24-in.....	5.052
" 10-in.....	1.408	" 30-in.....	7.195
" 12-in.....	1.809	" 36-in.....	9.683

A PAVEMENT OF WHALE BONES.—After most of the whales in the Atlantic had been captured the Nantucket leviathan hunters pushed their way around the Horn and into the Pacific ocean, making headquarters at Monterey, California, which then belonged to Mexico. And in this old Spanish town is a pavement that leads from the street to the church of San Carlos de Borromeo—really it connects Nantucket with Mexico—made of the vertebrae of whales. The pavement is unique, and hundreds of people walk on it without guessing its history.

A WAITER FOR A MAYOR, and why not? Massachusetts has a cobbler for governor and we have had a rail splitter for president; even Cincinnati had business at home. The Hon. Auguste Avenengo, mayor of Montvale, N. J., is a waiter in the Savarin, in the Equitable Assurance Building of New York, and though exemplar as a waiter, as a mayor and as a man, he is in danger of being written up as "frenzied" by the press from his connection with a concern that feeds Wall street.

FIRE FIGHTING SYSTEMS

An Australia Fireman's Conclusions After Inspecting the Fire Departments of Forty-five Cities of America and Europe

IN the January issue of THE MUNICIPAL JOURNAL a part of the report of Superintendent Webb, of the Sydney, N. S. W., Australia, Metropolitan Fire Brigade, as made to the Board after a thorough investigation of the working of the Fire Brigades and their methods of administration in forty-five of the principal cities of Europe and America. Some farther conclusions and comparisons from this very interesting and valuable report are here given.

ADMINISTRATION

The Fire Brigades Act of 1884, under which the Fire Brigades of New South Wales were first organized, appears to have been drafted on the lines of the London Fire Brigades Act of 1886, in that, outside the Australian States, London, Hamburg, Copenhagen, and Washington, D. C., the whole cost of maintaining fire brigades in the towns visited is borne by the ratepayers. In Hamburg, owners must insure their buildings, and the fire insurance companies are compelled to pay a portion of the premiums into the town treasury, towards the maintenance of the fire brigade. It is not compulsory to insure the contents of buildings. The insurance companies doing business in Copenhagen pay three-fourths of the cost of maintenance; but, as in Hamburg, owners of buildings are compelled to insure them. The other fourth is provided by the town authority.

In Washington, D. C., the United States Treasury pays half, and the town the other half of the cost of maintenance.

The contributions for the protection of London from fire are derived from the Government, the fire insurance companies, and the municipal authority. Originally, the Government contributed one-fifth, the insurance companies one-fifth, and the municipalities three-fifths. These proportions however, have not been maintained. Out of a total expenditure of some £215,000 in 1902, the Government contributed only £10,000, the insurance companies about £32,000, and the municipalities the remainder.

Many of the larger towns of Great Britain have power under their charters to clear owners and occupiers of buildings for the attendance of fire brigades at fires on their premises. This is productive of very great friction, and in many cases of actual hardship. Friction between the brigade and the public, in that brigades frequently have to sue in law courts to obtain the amounts claimed. Allegations of overcharging for the services rendered are very frequent. Hardship, because, in the case of a person uninsured, the charge is an additional burden to the loss sustained by fire, and therefore is made on the sufferer when he is least able to pay. In some towns the insurance companies, in order to protect their clients, pay the municipal authorities annual sums to cover the estimated amounts of these charges. In this manner the burden on the sufferer by fire who is insured, is lightened. The man who is not insured receives no consideration; he is simply fined for having a fire upon his premises.

The cost of maintaining a fire brigade varies according to the country in which a town is situated, and the description of its industries. It is safe to say that in the larger industrial towns much thought has been given, not only to protection from fire, but also to preventive measures.

In New South Wales the municipalities have power to levy rates only on land and buildings, but in the United States, the contents of buildings as well as the buildings are taxed, and therefore a larger revenue is gathered, relatively, than is collected in New South Wales.

In the United States of America the expenditure upon fire brigades, per head of town population, is greater than that in any other country. This is due to the large number of firemen in the brigades, the rate of wages, the large number of fire and life-saving appliances, and the larger sums paid for them.

ORGANIZATION

Where so much variety exists it would be invidious to say that one brigade is better than another, for, after all, it is a matter of individual opinion. On the continent of Europe military discipline and methods prevail. Officers of the Army and Navy also occupy positions as fire brigade officers, after having passed an examination, while men of good character are selected from the Army for duty in the ranks. The time thus spent is allowed to count as military service. The wage paid to these men is therefore only at military rates slightly augmented for special work.

The brigades of Great Britain, almost without exception, are under the command of experienced firemen, and if they had sufficient men and appliances, would be in the first rank of fire brigade organizations. The officers and men are of the best, but in the majority of cases the powers who should supply the money are sadly behind the age in their estimates of fire brigade necessities.

London, as the largest city, should be at the head of the fire brigade world, but it is not. My sympathies are with the old brigade, but I regret to say that, with the exception of its engines, the material is not up to the standard attained elsewhere.

New York possesses the largest fire brigade in the world. Everything money could buy in the way of fire appliances appears to have been purchased. Yet a number of large fires occur, which, as before stated, may be put down to the carelessness exhibited in the construction of buildings.

Most of the large cities of America have, at one time or another, had fires of magnitudes amounting to conflagrations. The bitter lessons of experience have educated them to more liberal knowledge of what constitutes a sufficient fire brigade establishment, than as yet obtains in other countries.

Chicago has a strong brigade and a number of experienced officers, but, as in New York, their efforts are handicapped by the carelessness in evidence everywhere.

The laxity shown in other towns is not so prominent in San Francisco. The town authorities, by insisting upon large water mains, numerous fire engines, numerous firemen, numerous fire alarms, and compulsory fire escape construction, have risen to a sense of their obligations. In the method of instruction, material for extinguishing fires, fire alarm system, and hydrants, San Francisco takes a very high position among the fire brigade organizations of the world.

FIRE STATIONS

The headquarters of the Edinburg Fire Brigade most nearly approaches my ideal of a fire station. It is on the top of a hill, and a point where several roads meet. The residences of the men, though forming a part of the premises, are separate from the station, and their families have a private entrance. Electric buttons in the watch-room, when pushed, cause brass plates in the stables and dressing hall to fall, showing which appliances are to be turned out. There is no shouting, each man has a place allotted (indicated on brass plates also). The stable doors open by electricity, and the horses are released at the same time. On moving the steam engine is lighted automatically.

Glasgow and Belfast have also very fine stations. Manchester has just laid the foundation for a new headquarters; the cost for ground and buildings being estimated at £120,000.

LADDERS

The ladders used for fire brigade purposes in Great Britain are of great variety, and officers of brigades, while dissatisfied with those in the market, are chary of recommending the purchase of ladders of new design. The brigades, therefore, are surpassed by those of the Continents of Europe and America with regard to ladders of the larger type. However, last year's exhibition of fire appliances at Earl's Court, London, has opened the eyes of many officers to the deficiencies of their brigades. Ladder work of British make is very reliable, but the mechanism of German ladders is far in advance of either the British or American.

Many years ago Americans designed an Aerial Ladder Truck for reaching great heights. This ladder was in two sections, and fitted to a turntable on a carriage, which enabled firemen to turn the ladder in any direction without moving the carriage. Owing to the excessive traveling length, the inventors added a device for moving the hind wheels so as to co-operate with the fore wheels in going round corners, and for generally manoeuvring the ladders. To this has been added mechanism of various kinds, water power, springs, chemical gas power, etc., to assist the men in raising the ladders from the horizontal to the perpendicular. In fact, everything which ingenuity could suggest for the rapid working of ladders appears to have been adopted, except the simple expedient of dividing them into three or four sections. Perhaps if they were built more compactly, and of less imposing designs, the makers would be unable to command the existing high prices.

Absolutely the most reliable ladder which came under my notice was that known as the "lattice girder ladder." This, with the German mechanism for working it, is the best and most reliable for general work at fires.

CHEMICAL FIRE EXTINGUISHERS, ETC.

Much attention was given to first aid appliances with a view to ascertaining which were to be preferred for adoption here. Chemical Fire Extinguishers of various designs have been used in America for many years, and are highly spoken of by all chiefs of brigades, the number of fires extinguished by them ranging from 40 to as high as 70 per cent. of the total outbreaks.

The appliances consist of a copper cylinder containing water, in which a quantity of carbonate of soda is dissolved. A bottle containing sulphuric acid is placed in a cage inside the cylinder. When required for use the acid is mixed with the water, carbonic acid gas is generated, and the appliance is ready for action. The gas supplies the motive force, and the chemicalized water is projected upon the fire. It is stated by the makers of chemical extinguishers that the solution has greater extinguishing power than water. This is no doubt true, but scarcely to the extent claimed by one maker—that one gallon of the solution, in his particular extinguisher, was equal to forty gallons of fresh water, in its fire extinguishing properties. On the Continent of Europe barrels of water carried on vehicles, are used in conjunction with tubes containing carbonic acid gas under heavy pressure. The gas, being allowed to pass into the barrel, supplies the motive force for projecting the water.

In the case of the chemical extinguisher, the sixty gallon appears to be the most handy size. The cost of the soda and acid is not large, but, presuming that only ten gallons of water be required to extinguish a fire, the other fifty gallons are wasted. A point in favor of the carbonic acid gas is that not only the water cylinder but the hose itself is charged with water up to the nozzle, and consequently the appliance can be brought into use even more quickly than the chemical extinguisher. As at least four of these can be obtained for the price of one chemical engine of similar capacity, considerable economy is effected. The advantages of the appliances in connection with self-propelling vehicles are so many that I propose to deal with the question in detail, in the near future.

FIRE ALARMS

Street fire alarms are installed in all large towns, as the readiest means by which an alarm of fire can be transmitted to a fire brigade. In Great Britain an iron box is placed on a post, or the wall of a building, and a call is given by pushing or pulling a knob, or turning a handle. Any of these actions ring a bell at the fire station, and exposes an indicator which shows the situation of the alarm pulled. To these, of late years, connections have been added in many towns, by which telephones can be utilized. In a few cases telephones placed in the boxes are also available to those who have keys.

On the Continent of Europe, when an alarm is pulled, a large bell is rung, and the number of the box is recorded in the Morse Code on a tape.

As a rule, throughout America, the alarm number is registered on a tape by holes punched in it, or by dashes corresponding to the box number. A gong is also struck.

The most elaborate bell-ringing system is that known as the "Gamewell," which is really a combination of American

inventions. The system presents numerous features of interest, and much ingenuity has been exercised to provide a reliable and effective system.

On an alarm being pulled the number of the box is struck on gongs in various parts of the central station or bureau, and is repeated three or four times, registered on a tape, and the number of the box repeated through the headquarters station to either the whole brigade or such stations as may be deemed desirable. Mechanism is also added, by which, if two alarms be pulled at the same time, each box registers without interference from the other. This is, perhaps, the quickest method in existence for calling a number of sections of a brigade together. Throughout America and Canada systems on the "Gamewell" plan are adopted, and various instruments, of which the Gamewell Company own the patents, are used, even where the system is not acknowledged as the Gamewell. An instrument to record the time of the alarm is also attached.

It is surprising that in one of the most progressive cities in England the general public are not allowed to touch a street fire alarm. Any one discovering a fire must seek a policeman, who then has to go to the nearest post and give the alarm. The brigade is part of the police force, although the officer in charge of the bridge has control at fires.

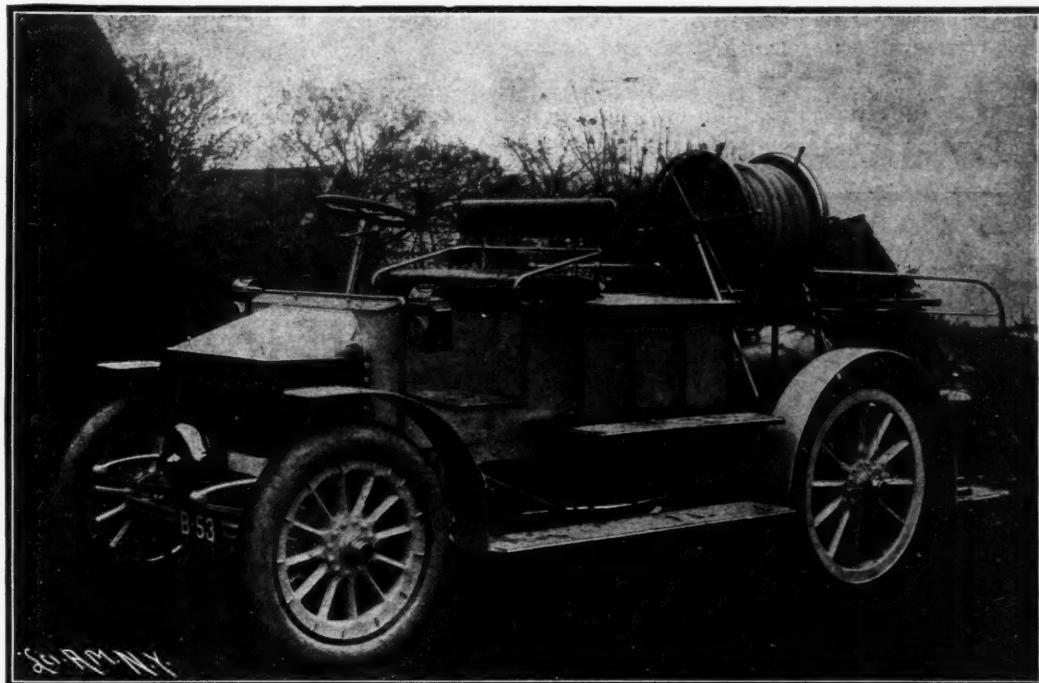
Gasoline-Motor Fire Engine *

A GASOLINE motor chemical fire engine has been constructed for Leicester, England, by the Wolseley Motor Car Company. Owing to the hard nature of the work which this appliance has to fulfil, the vehicle has been designed upon substantial lines. The chassis is built of channel steel of heavy section reinforced with stiff gusset plates and traverse members, riveted together. The wheel base is 9 feet 6 inches, and the track 4 feet 9 inches.

The wheels are of a special type. The rear wheels are slightly larger than the front, being 40 inches and 36 inches in diameter respectively. The wheels are of the wooden artillery type, but are specially reinforced with heavy wire spokes. The advantage of this arrangement is that not only is there additional strength in the wheel, but it can withstand very severe side strains, such as collisions with projections in the roadway, or the edging of the sidewalks, and the danger of collapse through rounding corners at high speed is appreciably reduced. The driving wheels are shod with heavy solid tires, while the front wheels are fitted with thick pneumatic tires to support the heavy weight of the vehicle. The wheel hubs run on plain phosphor-bronze bear-

ings and the axles are made in one piece of best steel.

The car is driven by a four-cylinder horizontal engine, developing 24 horse-power, running at a normal speed of 750 revolutions per minute. A single float-feed spray vaporizer is employed, while the ignition is of the ordinary high-tension type with accumulators and trembler coil. Cooling is effected on the usual system, the water from the engine passing into a battery of flanged radiating tubes and being cooled by a current of air induced by a high-speed fan driven by the engine. The water then passes into the tank and thence to the engine.



CHEMICAL FIRE ENGINE PROPELLED BY A 24-HORSE GASOLINE MOTOR *

Ample lubrication is effected from the dashboard to all parts. The change speed gear is of the general sliding type, a new pair of wheels being brought into action each time the speed is changed. Four speeds forward and one reverse are provided, the forward gear giving speeds of 7, 11, 15, and 20 miles per hour respectively. The transmission is through the ordinary cone friction clutch mounted on the crankshaft and connected by a chain to the gear-box. Chain drive from the countershaft of the transmission to the sprockets on the road wheels is employed. Adequate double-acting brakes, both foot and hand, acting on the drums cast on the sprockets of the road wheels, are provided. The gasoline tank has a capacity for 10 gallons. The chassis is constructed to carry safely a load up to 28 hundredweight and the total weight of the chassis is 20 hundredweight.

In the front of the engine is fitted a large double-bearing alarm gong to give warning of approach along the streets.

The body is of substantial build, with seat in front for two men, including the driver, with a box seat at the back to accommodate two more on either side. At the rear of the chassis is a step for the accommodation of a fireman, and sufficient space for two first-aid chemical cylinders. Brackets are fitted on either side to carry a short ladder, while the equipment of the engine is completed by a chemical cylinder and hose reel.

* Courtesy of *Scientific American*.

British Firemen's Protective Suit*

By W. G. FITZGERALD

THE Metropolitan Fire Brigade of London now have among their outfit, not only at the Southwark headquarters on the south side of the Thames, but also at all the leading substations, a number of ingeniously contrived apparatus which are something more than mere masks enabling the firemen to enter smoky buildings, being regular jackets and masks combined, and the wearer being supplied with fresh air by means of pumps, precisely as though he were a diver entering the depths of the sea.

The utility of this apparatus was very fully demonstrated a few weeks back, when a great and destructive fire broke out at a large chemical works on the eastern outskirts of London, the smoke from the burning material being dense, and poisonous in the extreme.



PROTECTIVE SUIT AS WORN BY BRITISH FIREMEN *

These apparatus, or at any rate, the more elaborate of them, are made by regular diving engineers.

Foremost among these apparatus comes the Fleuss dress, which is more especially designed to enable miners and mine officials to enter pits and shafts after a disastrous explosion of coal dust or fire damp, when it would mean certain death for any one to attempt to respire the poisoned air. It is not too much to say that hundreds of lives have been saved by means of the Fleuss apparatus.

Then, too, in most of the big refrigerating works in England, these jackets and masks are kept handy, much as fire-extinguishing apparatus are kept, so that in the event of any accident happening in the ammonia chambers, the rescuers may venture in with perfect safety to themselves, and effect the work of rescue.

The London firemen are thoroughly well versed in the use of these jackets and masks, and in considerable fires

where their use is necessary, they are taken on the engine in sets of two or four together with the necessary air pumps, which supply pure air to the communicating pipes.

Of course the fireman so accoutered has to be very careful in making his way not to get his air pipes entangled. There are other apparatus of somewhat similar kind, however, which do not need to be supplied by outside air pumps, but have a system whereby the respired air is purified and the necessary elements added to it, so that it can be breathed over again.

Another class of London public servants who understand the use of this invaluable apparatus are the men who work in the great sewers of London. It happens by no means infrequently that a party of three or four men taking their way through the main sewers, jack-booted and up past their knees in water, suddenly encounter an accumulation of mephitic gas.

Probably one or two of them may contrive to escape, leaving their companion or companions unconscious in the water or in the flat-bottomed boat which is sometimes used in the great sewers of London. Forthwith a rescue party is organized, and the Fleuss apparatus or another of the same kind is brought into requisition, with the result that the men overcome are without difficulty brought safely to the bottom of the manhole, and then raised without difficulty to the street surface.

These curious "diving dresses," as they may be called, since they enable the wearer to breathe in an otherwise impossible element, are often carried on board British warships, so that in the event of explosion, or similar accident, rescues can be effected before men unconscious or wounded can be wholly suffocated by smoke or gas.

The masks and jackets may also be found in such establishments as the great government powder mills at Waltham Abbey, particularly in the department where the secret explosive cordite is manufactured out of gun-cotton. Many a rescue has been effected by the aid of this apparatus after a serious explosion in the incorporating mills, or the semi-subterranean caverns in which the various nitro-compounds are handled.

Johannesburg Fire Department

THE third annual report of Captain R. Gordon Stuart, J. P., Chief Officer of the Johannesburg Fire Department, for the year ending June 30, 1904, contains some interesting data. During the year the Brigade responded to 154 calls, of which five were false alarms and 149 fires were attended, an increase of thirty-eight over the year previous. Of the total number of fires attended, thirty-nine were due to unknown causes, twenty-six were attributed to personal carelessness, sixteen to oil lamps and stoves and the remainder to various causes, as spontaneous combustion, sparks, etc. There were twenty fires during the year to which the Department was not summoned; these resulted in a property loss of \$68,000 and the death of a young girl.

* Courtesy of the *Scientific American*.

The total value of property within the city limits which was imperiled by the fires attended by the Brigade was estimated at \$8,998,000, and the value of property beyond the city line at \$1,299,000. The total loss sustained by fires attended by the Brigade was, inside the city \$379,582, and outside of the limits, \$280,789. The amount of insurance on property, within the city, that was actually on fire was \$5,261,000, and on property outside the city, \$691,000.

These figures are largely in excess of those for the year before, which is accounted for by the rapid growth of the city and the reopening of factories since the close of the war.

Fire and Police Personals

—At a recent election, Charles A. Riviere was elected chief of the fire department of Thibodaux, La.

—According to his usual custom, Chief Fred H. Wilson gave a banquet to the paid members of the Jamestown, N. Y., fire department, on Christmas.

—Mr. P. F. Kenah has been chosen chief of the South Amboy, N. J., fire department. He has been connected with the department for fourteen years.

—Fire Chief T. J. Casey, of Cambridge, Mass., has been pensioned by the city, at \$1,000 per year. He has been connected with the department for over fifty years.

—The fire department of Montgomery, Ala., presented Chief John T. Browder with a handsome gold Masonic watch fob, set with a beautiful diamond, for Christmas.

—Ex-Fire Chief Bert McAllister, of Bradford, Pa., has been appointed deputy sheriff and may be the Republican nominee for sheriff at the coming election. He is very popular.

—At the last meeting, in 1904, the city council of Lawrence, Mass., laid on the table, indefinitely, the ordinance creating a life tenure of office for the inspectors and sergeants of the police force.

—The council of Cleveland, O., recently passed an ordinance to raise the salary of Police Chief Kohler, from \$3,500 to \$5,000 per year. Mayor Johnson, however, vetoed it and the chief will get no raise in salary.

—Captain William H. Salisbury, of the Providence, R. I., fire department, has resigned on account of ill health. He has been connected with the department for twenty-three years. Lieutenant W. H. Millard is his successor.

—The city council of Springfield, Mass., has passed an ordinance providing that each fireman shall have three days' relief from duty, each month. If a general alarm is sounded while they are having the holidays, they must report for duty.

—Chairman Davis and Commissioners Haley and Farley, of the Police and Fire Board of Utica, N. Y., have just

been on a tour of inspection. Two new stations are being built in Utica and they have been investigating apparatus for the equipment.

—In speaking of big fires, Chief J. R. Canterbury, of the Minneapolis, Minn., fire department said that all big fires are of immense advantage to all the members of the department as there is always something new to learn, even to men of years' experience.

—Chief of Police Charles H. Hunt, of Portland, Ore., was recently indicted on a charge of malfeasance in office; but later the indictment was dismissed. Last July he refused to enforce the laws regulating gambling, which brought about the indictment.

—At the December election, Chief Clarence F. Byrd, of Flushing, L. I., was defeated by Frank Ryan. Chief Byrd has been chief of the fire department for the past two years and has the reputation for being one of the best, if not the best, chief that Flushing has had.

—Deputy Chief Schoeffel, of the Rochester police force, has visited New York, Albany, Syracuse and other cities in order to study their systems. He is devising a new platoon system to go into effect when the new station houses are finished, which will be about February 1.

—W. C. Workman has been appointed assistant chief of the Salt Lake City fire department. He was a member of the old volunteer fire department and when it was reorganized into a paid department he became a driver. Since then he has been advanced up to his present position.

—Chief Waters, of the Jackson, Ga., fire department, was presented with a beautiful toilet, by the board of fire commissioners on Christmas. The men of the department gave him a beautiful gold watch charm. The chief is very popular and was formerly a member of the Atlanta department.

—Mr. C. P. Townsend, formerly of the Jacksonville fire department has been appointed chief of the St. Augustine department. When he took charge of the St. Augustine fire department it was with the understanding that he would be made chief. The city council has recently confirmed this statement made by the committee to him.

—After thirty-eight years in the police department, Chief Joseph Cleary, of Rochester, N. Y., has resigned on account of ill health. He started in as patrolman and was advanced, step by step, to the position that he has just resigned from. His resignation, however, will not go into effect until March 1, when he will retire on half pay, \$1,200 a year.

—Since Police Chief John W. Ball, of Atlanta, Ga., became chief, four years ago, he has instituted a number of improvements, among which is bicycle service for hurry calls for policemen. He has improved the conditions in the barracks for the temporary relief of white women and children, and has had a cell fixed up for operating room for poor and unfortunate men. He is constantly improving the existing conditions.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books--What the Magazines and Reviews Have to Say about Civic Affairs--Municipal Reports Received

Books

Party Organization and Machinery. By Jesse Macy, Professor of Political Science at Iowa College. Cloth, 8vo., 293 pages. Price, \$1.25.

This is the third of eight volumes which will make up the "American State Series," and in its pages the author explains our complex American system of party government. The President is recognized as the accountable leader of the party in power who receives the public approval for popular measures and bears reproach for all partisan blunders, and to which might be added the blame for poor crops. Can it not be questioned, however, whether the President, as a rule, does not receive more candid treatment from the opposition than from his own party. In the administrations since the Civil War, Grant was quiescent in the hands of the leaders of his party and allowed the constitutional power of appointment to so far pass to the houses of Congress that it became a question whether the same evolution which had taken away that right from the English crown was not progressing here. The re-assumption of that prerogative by Hayes, and its assertion by Garfield, Arthur, Cleveland, Harrison and Roosevelt led to antagonisms within the party ranks and defeat for renomination or re-election whenever possible. McKinley, through the harmonizing influence of Senator Hanna both at the White House and at the Capitol, had a more pacific administration. But the history of the past thirty years indicates that President is more a scape-goat for his party than an object of attack by the opposition, and when a President is imbued by the responsibilities of his office with the desire to be the servant of the whole people, he must tread the press alone.

The greater part of the volume is devoted to chapters on the various committees, National, Congressional and State, and the methods pursued in typical States; as Pennsylvania, illustrating one solidly Republican; Missouri, one Democratic, and Indiana as a doubtful State. Massachusetts is taken to represent New England, and the organizations of the Southern States are reviewed.

For the citizen who does not learn by contact, and for the coming citizen, Professor Macy has produced a text book of genuine value, and has filled a space in our political literature not heretofore occupied.

Report of a Fire, Load and Water Test made upon a Reinforced Concrete Floor (Kahn System). Ira M. Woolson, E. M., New York, 1904. Price, 25 cents. Postage, 2 cents.

At the station at Columbia University for making tests of fire resisting construction materials, which is in charge of Ira M. Woolson, E. M., the Kahn system of reinforced concrete floor was satisfactorily proved with a fire, load and water test on September 30, 1904, with the result that it

was accepted as a fireproof construction by the superintendent of buildings of each of the several boroughs of New York.

"The purpose of the test was to determine the effect of a continuous fire below the floor for four hours at an average temperature of 1700° F., the floor carrying at the same time a distributed load of 150 pounds per square foot: at the end of four hours the under side of the floor (or ceiling) while still red hot to be subjected to a 1 1/8-inch stream of cold water at short range, through 100 feet of hose under sixty pounds pressure for five minutes, then the upper side of the floor to be flooded at low pressure: afterwards the stream to be again applied at full pressure on the under side for five minutes longer."

Chief Engineer Rudolph Miller and his assistant, Mr. A. Schwartz of the Fire Department, supervised the test. Cloth, 8vo., 301 pages, 28 illustrations. Price, \$1.50.

Handbook on Sanitation, by George M. Price, M. D. This book is intended both as a manual for municipal sanitary inspectors, and as a text book for candidates for such a position. Its author is the present Medical Sanitary Inspector of the Department of Health, of New York City, and has previously served as Inspector of the New York Sanitary Aid Society of the Tenth Ward; as manager of the Model Tenement-houses of the New York Tenement-house Building Company, and as Inspector of the New York State Tenement-house Commission, and, therefore, brings to his work a vast amount of experienced knowledge.

The scheme of the author divides this book into three parts, the first treating of Sanitary Science and including chapters on Soil and Sites, Air-subdivided into Ventilation and Warming; Water; Sewage and Plumbing. Part second is devoted to Sanitary Practice, including sections on Habitation, Occupation and Trades, Foods and Disinfection. And part third is devoted to Sanitary Inspection and includes Civil Service questions and tables of useful information. The book has a comprehensive index.

The value of the work is apparent, embracing as it does a résumé of the best text-books that have been published on the various subjects treated, and the necessary qualifications and duties of the inspector detailed by one whose exceptional service in, and deep study of the question qualifies him to speak with authority.

Articles in American Periodicals

A subway railway system is being planned for Chicago and *Proposed Passenger Railway Subways for Chicago, Illinois* is an article, with a number of diagrams, about this project. Another municipal improvement, that is contemplated, is described in *Report on Filtering the Croton Water Supply, New York City*. Both articles are published in the *Engineering News*, New York, December 22, 1904.

In his article, *Chicago's New Charter*, Hon. Francis W.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

Parker, State senator of Illinois, describes the awakening that the citizens of Chicago have had since they decided to have a new charter. To use his own words, "Citizens who never before studied a public question or read anything but a newspaper now talk only of the charter." This article is published in *The World To-Day*, Chicago, Ill., January, 1905. Price, 10 cents.

The Engineering Record, New York, December 31, 1904, contains an interesting article on Portland cement, by R. C. Carpenter entitled, *Materials Which Retard the Setting of Portland Cement*. In the same number is *Underground Railways of London* with a diagram showing the different systems.

The Engineering Record, New York, December 24, 1904, contains a number of interesting articles. The first is an illustrated article, *Rapid Transit Railroad Construction at Battery Park, New York*, which describes the reinforced concrete work of the subway at the lower end of Manhattan. This article is followed by *The Condition of the Croton Water-Works, New York*; *The Longevity of the Typhoid Bacillus in Water*, with a diagram, by George C. Whipple; *The Cost of Water Filtration at Reading, Pa.* (Illustrated); *What Can Chemical Research Do for the Portland Cement Industry?* which is part of an address by Mr. Clifford Richardson, delivered at the annual dinner of the Association of Portland Cement Manufacturers.

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Public Documents Received

Annual report of the Department of Public Safety, Syracuse, N. Y., 1903. Ralph S. Bowen, commissioner.

Fourth annual report of the Bureau of Water, Department of Public Works, Syracuse, N. Y., 1903. Thomas F. De Lany, superintendent.

Annual reports of the City Engineer and Commissioner of Public Works, Syracuse, N. Y., 1903. Frank J. Schnauber, city engineer.

Annual report of the City Comptroller, Kansas City, Mo., 1903. Andrew E. Gallagher, city comptroller.

Thirty-third annual Comptroller's report, Troy, N. Y., 1903. William H. Gearin, comptroller.

Report of Board of Street Commissioners, Binghamton, N. Y., 1903-04. Hon. S. L. Smith, president.

Report of Board of Health, Binghamton, N. Y., 1903. Hon. S. L. Smith, mayor.

Report of Common Council, Binghamton, N. Y., 1903-04. Hon. S. L. Smith, mayor.

Reports of Malden, Mass., 1903. Hon. Charles L. Dean, mayor.

Annual reports of Montgomery, Ala., 1903. Hon. E. B. Joseph, mayor.

Report of third annual convention of the League of Georgia Municipalities, held at Savannah, Ga., August 10-12, 1904. Hon. James R. Atwater, president.

Report of fifth annual convention of League of Third Class Cities of Pennsylvania, held at Wilkes-Barre, Pa., September 6-8, 1904. Hon. George H. Potter, president.

Charter of the city and county of Denver, Colo., framed

by the second charter convention, February 6, 1904. Charles H. Marshall, president.

Annual reports of Cleveland, O., for 1903-04. Hon. Tom L. Johnson, mayor.

Annual reports of Montgomery, Ala., for 1904. Hon. Thomas H. Carr, mayor.

Annual reports of Worcester, Mass., for 1903. Hon. Walter H. Blodget, mayor.

Annual reports of Cincinnati, O., for 1903. W. T. Perkins, city auditor.

Annual report of comptroller of Syracuse, N. Y., for 1903. Eugene J. Mack, comptroller.

Annual reports of Waterbury, Conn., for 1903. Hon. Edward G. Kilduff, mayor.

Fifteenth annual report of the auditor of Fall River, Mass., for 1903. Henry W. Clarke, auditor.

Annual reports of Springfield, Ill., for 1903. Hon. Harry H. Devereaux, mayor.

Annual reports of Holyoke, Mass., for 1902. Hon. Arthur B. Chapin, mayor.

Annual report of the controller of Tacoma, Wash., for 1901. Alfred Lister, controller.

Annual message of mayor of Salt Lake City, Utah, 1904. Hon. Richard P. Morris, mayor.

State report of oiled roads in California, October, 1904. N. Ellery, commissioner.

Mayor's annual message and third annual report of department of Public Safety, Scranton, Pa., for 1904. Hon. A. T. Connell, mayor.

Annual reports of Taunton, Mass., for 1903. Hon. Richard E. Warner, mayor.

Annual reports of Little Rock, Ark., for 1902 and 1903. F. M. Oliver, city clerk.

Proceedings of ninth annual convention of the Kansas Municipal League held at Wichita, Kan., December 11, 1903. B. F. McLean, president.

Annual reports of Richmond, Va., for 1902. Hon. Richard M. Taylor, mayor.

Annual reports of Harrisburg, Pa., for 1902. Hon. Vance C. McCormick, mayor.

Annual reports of Joliet, Ill., for 1902-3. Hon. William C. Crolius, mayor.

Annual reports of Cedar Rapids, Ia., for 1903. Hon. Charles D. Huston, mayor.

Annual reports of Providence, R. I., for 1903. Hon. Augustus S. Miller, mayor.

Fifty-eighth annual report of auditor of Providence, R. I., for 1904. Philip S. Chase, auditor.

Annual report of department of Public Works, Rochester, N. Y., for 1903. E. A. Fisher, city engineer.

Eleventh annual report of Electrical Commission Board, South Norwalk, Conn., for 1903. J. A. Volk, president.

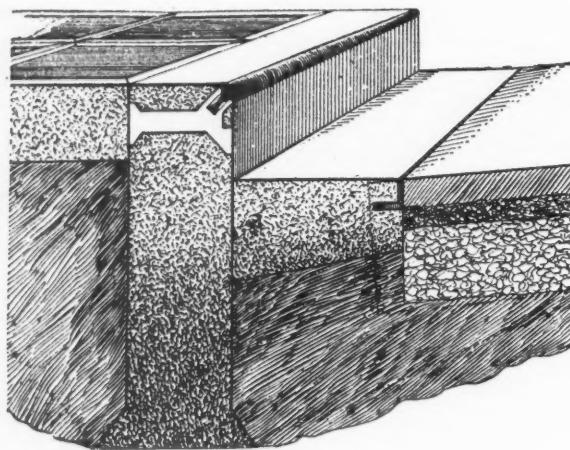
Yearbook of legislation, of New York State for 1903. Robert H. Whitten, sociology librarian.

Fourteenth and fifteenth annual reports of Commissioners of Public Parks and annual report of the department of Public Works for 1903. Hon. John P. Studley, mayor.

Annual reports of South Norwalk, Conn., for 1903. Hon. Charles E. Dow, mayor.

Wainwright Steel-Bound Curb

PREVIOUS to the year 1890, Henry H. Wainwright, of the city of Philadelphia, Pa., had been engaged in what is known as the "cement business," and in conducting operations requiring the use of Portland and other hydraulic cements, and the additional aggregates required to form "concrete," now in general use in building construction and



CUT NO. 1

the laying of sidewalks, street curbs and various forms of street pavements.

Among such operations was the making and laying of ordinary concrete curbing and coping, faced with a finer mixture of cement than the body and base of said curbs was composed of, producing what is known, in general terms, as cement or concrete street curbs.

Experience in the making and use of such curbs showed an inherent weakness or defect, caused by the liability to break or be otherwise injured on the corner or exposed edge from contact of wagon or truck wheels, or heavy merchandise or machinery, causing chipping of the surface and destroying the beauty and symmetry of appearance of such curbs when subjected to such contact.

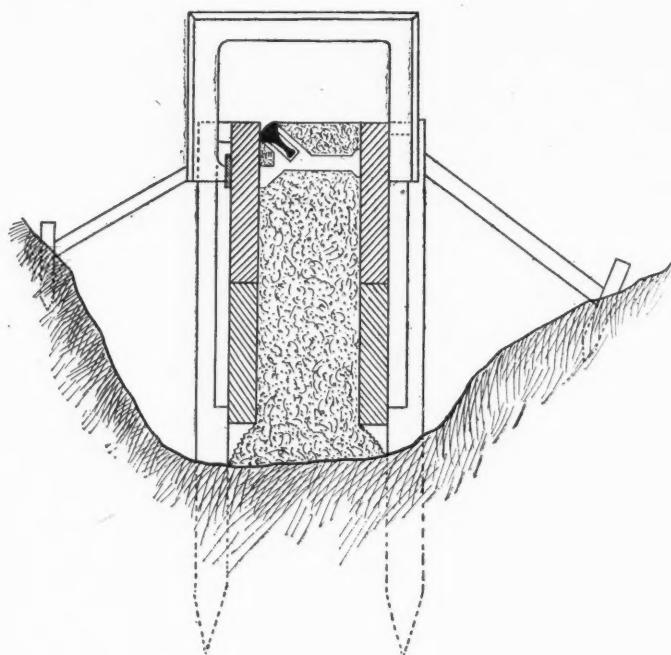
This experience resulted in an invention, for which a patent was granted on May 20, 1890, to said Henry H. Wainwright, for "Street Curbs," numbered 428,432, and in the following year experiments and practical tests were made proving its superiority to any style of concrete or metal-bound curbing ever before laid or used.

Reference to this patent will show that the protecting feature of the invention, entirely remedying the inherent defect of liability to break or chip on the exposed corner or edge, was a rounded or curved corner bar made of iron or steel, having a web or tongue projecting or extending into the mass of concrete and firmly imbedded therein, and surrounded in all its parts, except the exposed

surface, by the concrete, which at first soft and plastic, soon hardened, so that the bar and concrete eventually became a homogeneous mass, equal in solidity and as hard in composition as granite or other stone, and with an outer protecting surface less liable to break, or wear, or chip than any stone surface.

This bar was held in position by an iron frame while the concrete was soft and plastic, said frame having a slot in a projection intended to receive the web or tongue, and retain it in proper position until the surrounding mass of concrete set and became hard, usually in one or two days.

Some features of this patent, as shown in description and claims, were of excessive weight and superfluous as to utility or necessity, and added greatly to its cost of construction, and although the curb as laid had great practical merit and value, its cost prevented it from becoming a commercial success as against competing material, such as granite or other stone used for curbing purposes.



CUT NO. 3

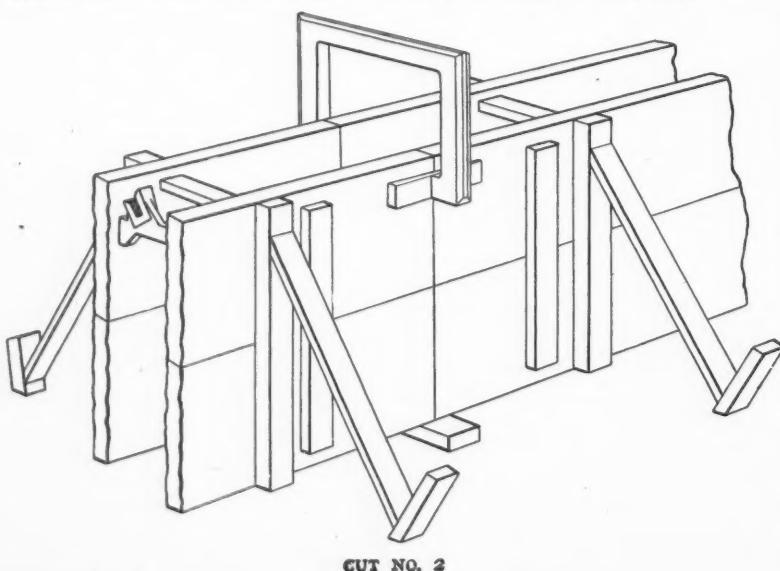
These conditions gradually led to further improvements which were patented March 9, 1897; November 22, 1898, and May 5, 1903. The Steel Protected Concrete Company, of Philadelphia, Pa., has introduced hundreds of miles of this improved curbing.

Cut No. 1 illustrates the style of completed curb now most preferred. The corner bar is a round-headed galvanized steel "T" bar with a dovetailed web or stem projecting about two inches into the concrete and is firmly held in place by virtue of the dovetail web. The frog is of cast-iron placed at convenient intervals to receive the bar and hold the same in correct position while the curb is being finished. The gutter it requires is laid after the curb is entirely finished, and is protected on its outer edge by an angle iron not galvanized. This iron adds but little to the cost of the gutter, though it greatly increases the durability of both the gutter and pavement adjacent.

Cut No. 2 shows manner of setting the frames in which the curb is moulded.

Cut No. 3 shows a section of completed curb before frames are removed. This curb is usually laid six inches in thickness by twenty inches in depth, with no special foundation unless the conditions are unusual. The frames should be carefully set by a skilful person so they will remain true to line and grade during the operation of placing the concrete.

The concrete should be of the best Portland cement, clean sharp sand and clean broken stone (the run of the crusher



CUT NO. 2

under three-quarter inch, dust removed, if preferable). A fair proportion for the mixture is 1, 3 and 5, though it is sometimes desirable to make it richer. What is known as a dry concrete is preferable to wet for the reason that the frames are so close they hold the water which will appear on top and interfere with finishing the curb.

The corner bar is put in position after the concrete has been well rammed within two inches of the top of the frames, the bar being set in a cushion of fine top mixture, then a little more concrete is added, and the top finish laid on about one inch thick and finished as soon as possible.

The following morning the frames should be removed and the front of the curb faced down to the gutter line. There is a very important point to be observed in connection with facing any concrete which is already set in order to prevent checking and peeling off. The best way to prevent this is to add no perceptible material to the face of the work, but to simply fill the interstices and smooth the surface.

New York Central's New Station

PLANS for the new Grand Central Station have been submitted to the Board of Estimate and the work of building its \$25,000,000 terminal station, thoroughly adjusted to the requirements of unprecedented growth and the change which electrical power has wrought, will soon be begun.

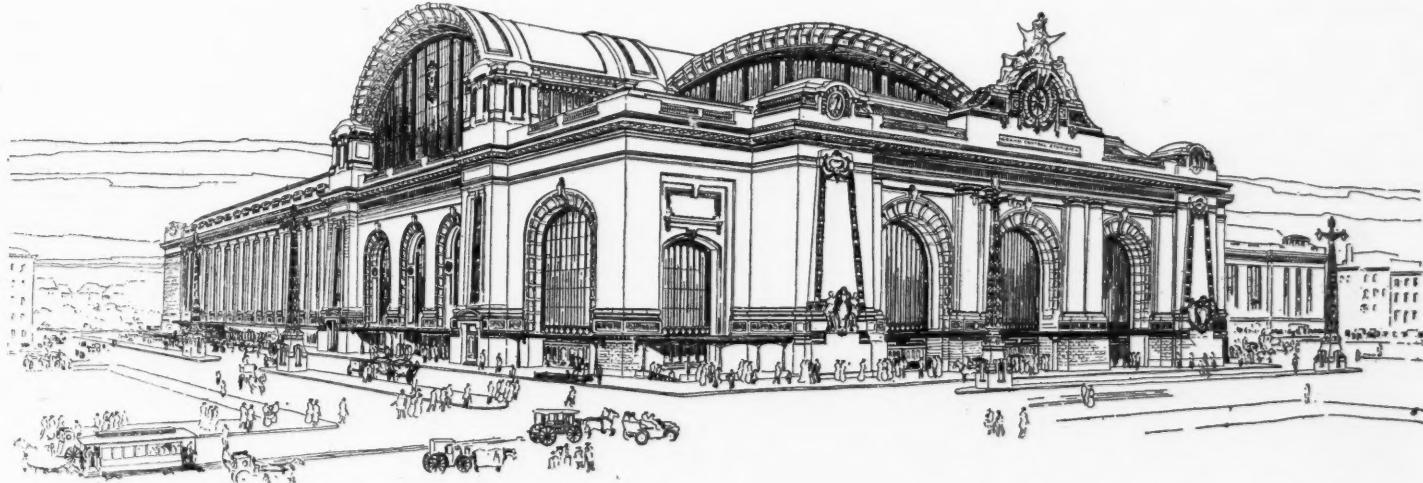
The present station occupies an area of about five blocks, and an idea of the immensity of the new building can be had from the

The frontage of these buildings will be 680 feet on Vanderbilt avenue, 625 feet on Forty-fifth street, 460 feet on Lexington avenue, 275 feet on Forty-fourth street, 260 feet on Depew place, and 300 feet on Forty-second street.

In addition to the public streets, there will be connections by ample private roadways and walks to Madison avenue on the west and Lexington avenue on the east; thus giving the traveling public, facilities for entering the station not only from Forty-second street on the south, Vanderbilt avenue and Depew place, but from Madison avenue on the west and Lexington avenue on the east.

The suburban trains will be on a lower level than the express trains, thus separating the commuter from the express passenger and affording better facilities for both. The suburban concourse will provide for nine tracks. The express concourse will be slightly depressed below the street level and will provide for twenty-two passenger train tracks and eight express tracks, making forty-three tracks in all, with platforms so connected by subway and elevators that baggage, mail and express may be quickly transferred without crossing the tracks.

The main entrance to the station is on Forty-second street. Its architectural composition is three massive arches, each arch being thirty-three feet wide and sixty high. Beyond these arches one enters an enormous ticket lobby, ninety by three hundred feet. This ticket lobby is on the level with the street. On the right of this lobby, and practically a part thereof, is the outgoing baggage room. After purchasing one's ticket and checking one's baggage, one proceeds to the express train by entering a gallery overlooking the grand concourse and thence to this concourse, which is on the level of the express tracks. This concourse is approached by



THE GRAND CENTRAL TERMINAL STATION OF NEW YORK CITY
FOR THE NEW YORK CENTRAL AND HUDSON RIVER RAILROAD CO

WILLIAM A. WETMORE
AND SON
ARCHITECTS

statement that it will require more than nineteen city blocks between Forty-second and Fifty-seventh streets and Madison and Lexington avenues.

The plans for the new terminal in New York City involve the use of an area of more than nineteen city blocks between Forty-second and Fifty-seventh streets, Madison and Lexington avenues.

The station proper, together with the post office and express buildings, will cover the blocks between Vanderbilt and Lexington avenues from Forty-fifth to Forty-third streets inclusive, and the block fronting on Forty-second street between Vanderbilt avenue and Depew place.

The buildings will set back from Forty-second street a distance of about forty feet, and back from Vanderbilt avenue a distance of about seventy feet, so as to afford a generous approach to the station and give the effect of 140 feet open space on the Forty-second street frontage and 130 feet open space on the Vanderbilt avenue frontage.

four grand staircases, each twenty-five feet in width. This concourse is the largest in the world, being 160 feet by 470 feet, and 150 feet high, with wide entrances at each and extending to Madison and Lexington avenues. Adjoining this concourse are the usual waiting rooms, retiring rooms, cafés, telephone and telegraph facilities, etc. The waiting rooms contain twice the area of the waiting rooms in the Grand Central station as it is at present. Through this concourse pass the departing and arriving passengers, but the arriving passengers are absolutely separated from the departing passengers, thus avoiding the usual confusion in a railroad station caused by the meeting of incoming and outgoing passengers. From the concourse one goes to the trains in the train room. The platforms are of ample width, averaging from fifteen to eighteen feet wide whereas the narrowest platform of the present station is but eight feet wide and the widest is but twelve feet wide. This liberal width of platforms affords ample facilities for quickly leaving the train and avoids the usual crowding. The suburban train

room has a splendid feature for quickly emptying the trains and avoiding crowding, by having platforms on either side of the train. These platforms are even wider than the express platforms, ranging from seventeen to twenty-nine feet in width. The concourse end of all express platforms have the additional advantage of being free from the handling of baggage.

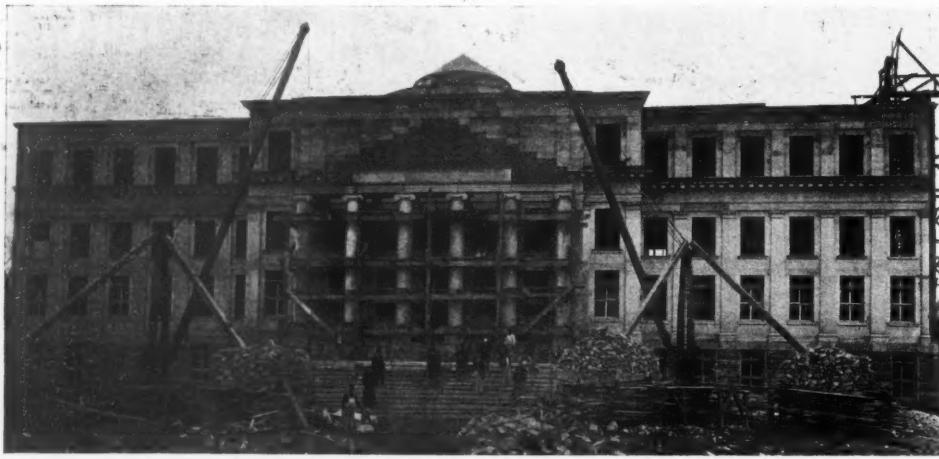
The exit from the station is along Vanderbilt avenue, approached by ample staircases. To the north and along Vanderbilt avenue is the incoming baggage, conveniently placed for arriving passengers. The company's cab stand is on the level of the concourse and the express tracks. In the provision for this cab stand the railroad company has been more than generous, allowing more space than would be contained in Fifth avenue between Thirty-third and Thirty-fourth streets if the avenue were twice as wide as it is at this point. The cab stand may be reached with equal facility by the suburban and the express passengers.

To the north of the concourse and carrying the cornice line of this monumental part of the building, around the entire building, are placed the company's offices, containing about 250,000 square feet in area, exclusive of corridors, elevators, etc., with entrances at the two corners of the building at Forty-fifth street and Park avenue, and with ample elevator facilities leading to the concourse itself. These offices are built around a magnificent court, thus providing beautiful light for each office and providing for special natural light in the higher part of the train room.

Provision is made for doubling the capacity of the station without in any way interfering with the architectural features or general plan of the station. The façade presents an effect which appeals to one at once as presenting a magnificent station and one which will be an ornament to the city, and one of which citizens may well be proud.

University Buildings Made of Cement

THE new Arts Building of the Ottawa University, of which mention has been made heretofore, has been completed and the authorities of the University have decided to construct all of their buildings on the college grounds and two seminaries situated elsewhere of the same Portland cement concrete.



ARTS BUILDING OF OTTAWA UNIVERSITY MADE WITH PORTLAND CEMENT—THE INTERNATIONAL PORTLAND CEMENT CO., OTTAWA, CANADA

The use of Portland cement as building material is rather the discovery of a lost art than a new art, for the Pantheon of Rome and many of the buildings which have endured through ages are of concrete, and for all architectural purposes it possesses points of superiority in strength, durability, and resistance to fire over other materials now used.

In the Ottawa building beams, girders, pillars, stairways and floors are all of cement concrete, and from top to bottom there is no crack or crevice to mark the beginning or the end of the work. It is as though the rooms had been chiseled from the solid rock, and the building is, of course, perfectly fireproof. In fact, while

stone will crack and brick will melt under intense heat, cement becomes harder.

A beam twenty feet long was tested just sixty days after it had been finished by placing in the center a weight aggregating twenty-two tons, and in twenty-four hours the beam was deflected less than one-tenth of an inch, and when the load was removed it went back to its absolute level.

The University Board have found that Portland cement concrete is cheaper for them in the ratio of 18 cents per cubic foot to 22 cents per cubic foot for stone and iron, and it is their entire satisfaction in the results obtained in this building that has determined them to erect the other buildings of the same material.

Bitulithic in St. Louis and Shreveport

In a previous issue of THE MUNICIPAL JOURNAL a report on the investigation of bitulithic pavement in St. Louis and Shreveport made by City Engineer E. A. Kingsley, of Little Rock, Ark., was published. The City of Little Rock wished to be doubly sure about the matter and, therefore, had the city engineer make a further investigation with especial reference to a comparison between bitulithic and asphalt pavements. The following is an extract from the supplementary report:

"I went to Shreveport, La., to make a more thorough investigation of bitulithic paving and a comparison between bitulithic and asphalt. I had a splendid opportunity of examining not only the older streets but the new ones which are being put down and the methods used in manufacturing bitulithic mixture.

"The asphalt streets of Shreveport were put down by two different companies, The Southern Paving & Construction Co., a subsidiary company of the Barber Asphalt Co., and the Memphis Paving Co. The Memphis Paving Company's work is far superior to that of the Barber Co., the latter's pavements lasting but a short time before disintegration sets in. The citizens told me that they have had a great deal of repair work to do on their work and it certainly shows up badly.

The Memphis pavements have, some of them, only been down a short time. They are in much better shape than even the newer pavements of the Barber Co., but they are already developing good sized cracks in a great many places. This does not speak very well for the asphalt work. The bitulithic pavements are, to a great extent, comparatively new. None of them have been down more than a year. They are certainly in far better shape than even the newest asphalt pavement, and so far as can be determined, are far superior in every way to asphalt.

"I went pretty thoroughly over the town on foot and in an automobile Sunday and Monday morning with the bitulithic contractor. I went out to their plant and went very thoroughly over the plant. Their pavement consists of a mixture of asphaltic or bituminous cement and rock. The rocks are crushed on the ground and screened into different sizes, then they are mixed by weight, giving a certain proportion of each to each batch of mixture. The rocks are heated before they are put in the mixing machine and are hot when the cementing material is added. This is also put in by weight, the claim being that only enough of the cementing material is used to fill up the voids and give a proper bond. This whole batch is then thoroughly mixed in the machine and taken out at a temperature of between two and three hundred degrees and put on the street where it is spread and rolled in the same manner that our asphalt streets are rolled, excepting that the roller is much heavier than those ordinarily used on asphalt streets.

"Many of the St. Louis streets are put down with perfectly smooth surfaces, giving more or less the effect of an asphalt street; but the Shreveport streets are left with a rougher surface than

those in St. Louis. This, of course, is both an advantage and disadvantage. The advantage is that horses will not slip on the pavement, and the disadvantage is that it is harder to clean.

"The bitulithic people put their streets down on either macadam or concrete foundation, depending on the character of the subsoil. With our soil most of our streets could be put down on a good macadam foundation, decreasing the cost over that of concrete. The bitulithic pavement on concrete base costs about the same as an asphalt street. Owing to the fact that we have the rock in quantities here at home, we have that advantage over Shreveport, and possibly the bitulithic could be put down for a little less than asphalt. Of course this could only be determined by a trial. Shreveport streets are running from \$2.15 to \$2.25 per square yard.

"I talked with a number of the business men of Shreveport during my visit there and with a number of men at other places who are in a position to give valuable information on paving questions, and the majority seem to favor bitulithic over the asphalt. The principle of the street is certainly much better than the principle of asphalt, it being a mixture of the same kind of cementing material and rock while the asphalt is sand. I have no hesitancy in saying to you that I consider the bitulithic pavement superior in every way to asphalt. It is noiseless the same as asphalt and it can be put down softer than asphalt on account of the rock as a base. This I believe adds materially to the life of the pavement as all asphalt men seem to be working for as soft mixtures as can be obtained. One fact of bitulithic pavement, which adds greatly to its usefulness is that the binder which they are using is waterproof, and water will not disintegrate the pavement as is the case with asphalt. It does not seem to roll as does our sheet asphalt pavements and evidently stands as hard, or harder, wear as the asphalt pavement with much better satisfaction. For instance, one of the streets in the business district of St. Louis has been down two summers and one winter and notwithstanding the fact that it was put down over the protest of the contractors on account of freezing weather, it has stood the test remarkably well, and to-day is in better shape than the majority of the St. Louis pavements. This test to me is an exceedingly strong point in favor of the bitulithic pavement.

"I have just learned that in a competition at Shreveport the bitulithic people succeeded in getting practically all of 40,000 square yards at a price running at about 10 cents per square yard over a bid of the Barber Asphalt Co., and in the place of what seemed a strong campaign of the asphalt people for the work. The smaller part of the 40,000 square yards was to be brick and the contractor who bid for the bitulithic pavement submitted also a bid on the brick pavement and the whole thing was awarded to them, more than 30,000 yards being for the bitulithic.

"While I have not a word to say against the Arkansas Rock Asphalt Co. or the Memphis people, or any other asphalt company, I am very strongly opposed to allowing any more asphalt streets to be put down in Little Rock until we see what becomes of West Third street. West Markham street is proving such a miserable failure that I am very much afraid of the conditions on West Third street. If West Third street is a failure it is due, in my opinion, to the asphalt, and nothing else, as the street is being put down strictly according to specifications. If there is any new work coming up in the near future I certainly hope that they will not put down asphalt. For the heavy traffic downtown streets I would prefer, possibly brick; but for the resident streets and other streets where a noise is detrimental, I would recommend a bitulithic pavement, unless, after due trial we find that the Arkansas rock asphalt is a success, which I doubt. I would not be willing to try any more asphalt of any kind inside of the next fifteen or eighteen months if the matter were left to my decision and I hope you can bear me out in this."

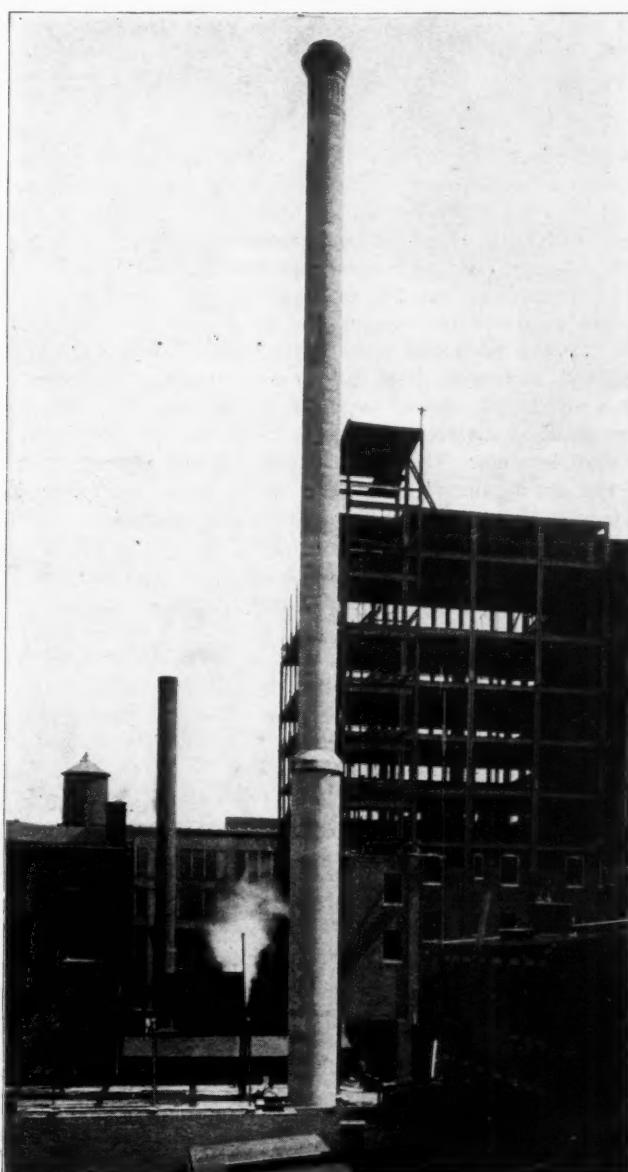
—Mr. J. P. Johnston, who has resigned his position as Western Sales Manager of the Alphons Custodis Chimney Construction Company, is now connected with the Webster Steel-Concrete Chimney Company, 159 La Salle street, Chicago, Ill.

The Weber Steel-Concrete Chimney

A GREAT deal of interest is manifested in the "Steel-Concrete Chimneys" being built in different sections of the country by the Weber Steel-Concrete Chimney Company, of Chicago. These chimneys have a great many advantages, among which are the following:

They are monolithic, consisting of a single solid piece from base of foundation to the top of the chimney, and being built of concrete and artificial stone, the influence of the atmosphere which disintegrates brick or natural stone, add to the strength and beauty of a concrete chimney, built under this system of construction, as only the very best materials are used.

Another advantage is, that it can be built on a much smaller area than a brick or self-supporting steel chimney, which is of



THE WEBER STEEL-CONCRETE CHIMNEY

great importance in a modern steam plant, where space is a consideration. In addition to economy of space, these chimneys are much lighter and do not require such heavy foundations.

The concrete in the chimney is reinforced with vertical tee steel bars of different dimensions from $1" \times 1" \times \frac{1}{2}"$ to $1\frac{1}{2"} \times 1\frac{1}{2"} \times 1\frac{1}{2}"$. The weight and number of these bars being entirely dependent upon the dimensions of the chimney, wind pressure, etc. the chimneys are designed to withstand fifty pounds wind pressure per square foot.

A number of these chimneys have been erected at different places, among them being one built at Bellevue, Mich., for the Burt Portland Cement Co., 182 feet high and 8 feet inside diameter; at Ziegler, Ill., for the Ziegler Coal Co., 154 feet 10 inches high and inside diameter 6 feet; another—illustration is shown herewith—is 176 feet 7 inches in height and inside diameter 4 feet 6 inches. This chimney is now being built for Joseph McWilliams & Co., for the New Seelback Hotel, Louisville, Ky. An immense chimney is now being started at Tacoma, Wash., at the Tacoma Smelting Company's plant, which will be 300 feet high and 18 feet inside diameter. This will be the largest reinforced concrete chimney ever built and one of the very largest chimneys in the United States. This company is also erecting a large chimney 200 feet high and 12 feet inside diameter at New Orleans, La., for the Consumers' Electric Company's plant.

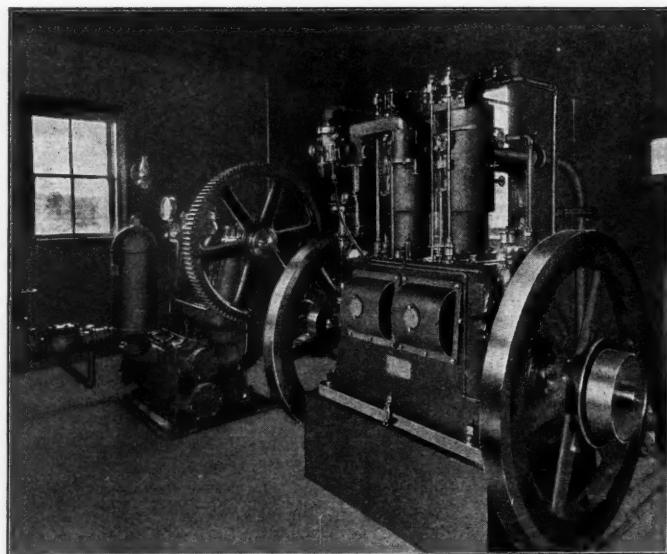
One of the strongest points in favor of these chimneys is that they improve with age and that the longer a concrete chimney stands, the better it is, which is of the highest importance.

The Walrath Engines

THE Marinette Gas Engine Company, of Chicago Heights, Ill., builders of the Walrath engines, make the proud claim that the sun never sets on the Walrath engines for, in the past ten years, it has filled orders from all parts of the world.

The Walrath is of the vertical type and, as such, requires a less massive foundation, has less vibration, is more durable as to the wear on cylinders and pistons and gives a greater economy of space than the horizontal type. It is built in one, two and three cylinder sizes ranging from 2 to 300 horse-power for belted and from 8 to 300 horse-power for direct connection. The base is cast in one piece, and is accurately bored to receive cylinder, crank and cam shaft bearings. The main bearings are cast separate from the base and are all turned up together on an arbor and are made to

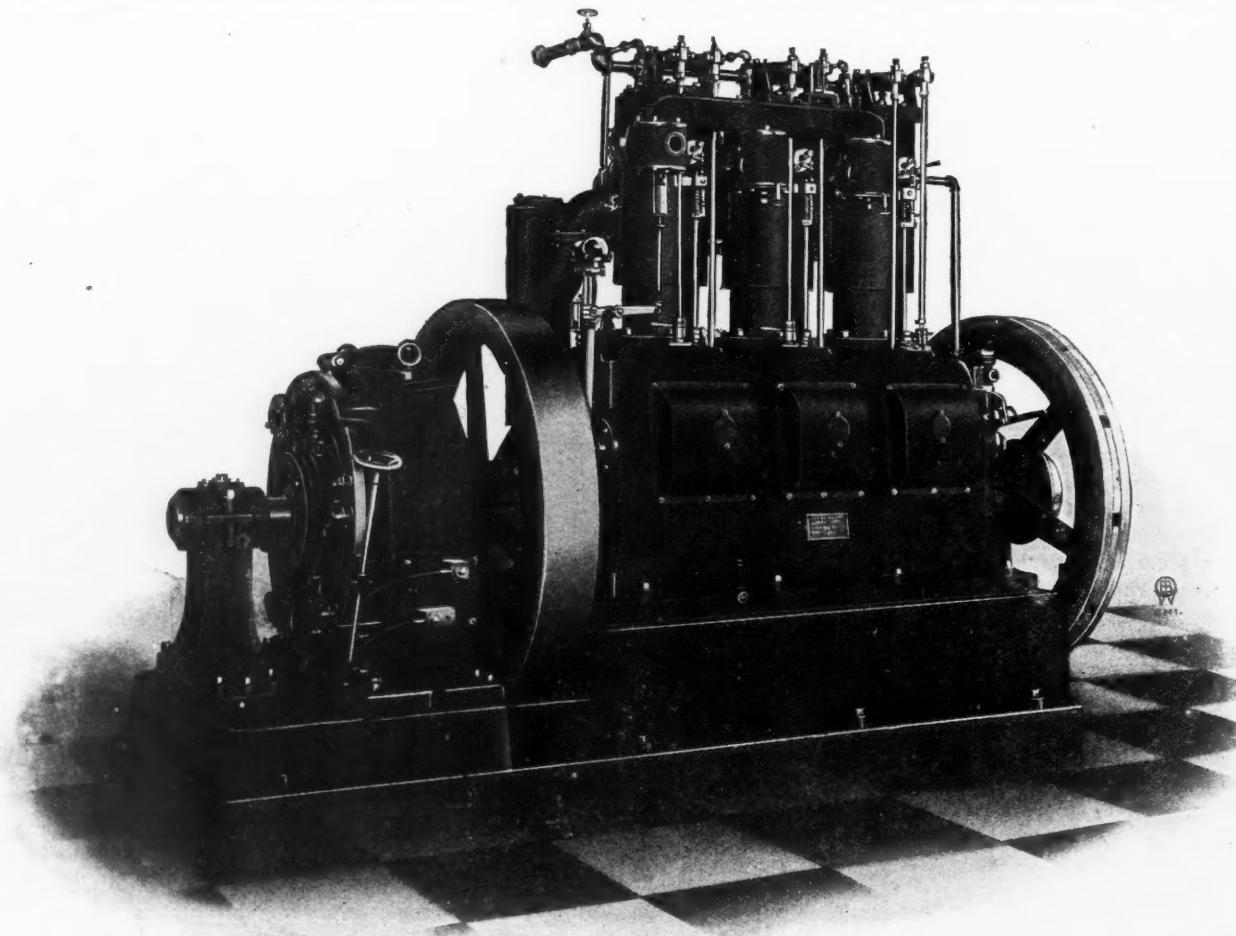
fit the base perfectly assuring a perfect alignment of the crank shaft. They are lined with the best quality of babbitt and are removable without disturbing the crank shaft. The cylinder, or cylinders, are



TWO CYLINDER ENGINE, DIRECT CONNECTED TO TRIPLEX PUMP

so bolted to the base that it is impossible for them to get out of line, and they are water-jacketed to prevent overheating.

The cylinder head is fastened with studs to insure a tight joint, and holds the cages which contain the valves; this permits of the valves being taken out for cleaning or regrinding without disturbing the head or any of its connections, and in the multiple cylinder type any one of the cylinders may be cut out while the engine is running.



THREE CYLINDER ENGINE, DIRECT CONNECTED TO GENERATOR

permitting the changing of valves or igniter plugs without stopping the engine. The valves are of the poppet type, which experience shows is the only style that will withstand the heat to which they are subjected; one is for the inlet of explosive mixture and the other for exhaust. The pistons are extremely long reducing the wear to a minimum. Fly-wheels are fitted with split hubs to insure accurate fitting and balance weights are fastened directly to the crank shaft.

All engines of 20 horse-power and over are supplied with an air compressor and tank by which means the engine is started. The governor is of the common fly-ball type driven by bevel gears, and is made to operate a piston valve which regulates the exact amount of explosive mixture for each impulse to maintain a steady speed under all conditions and variations of load. A two per cent. variation is the greatest change in speed from no load to full load, which equals the best of steam engines. Lubrication is automatically performed by a simple but efficient device.

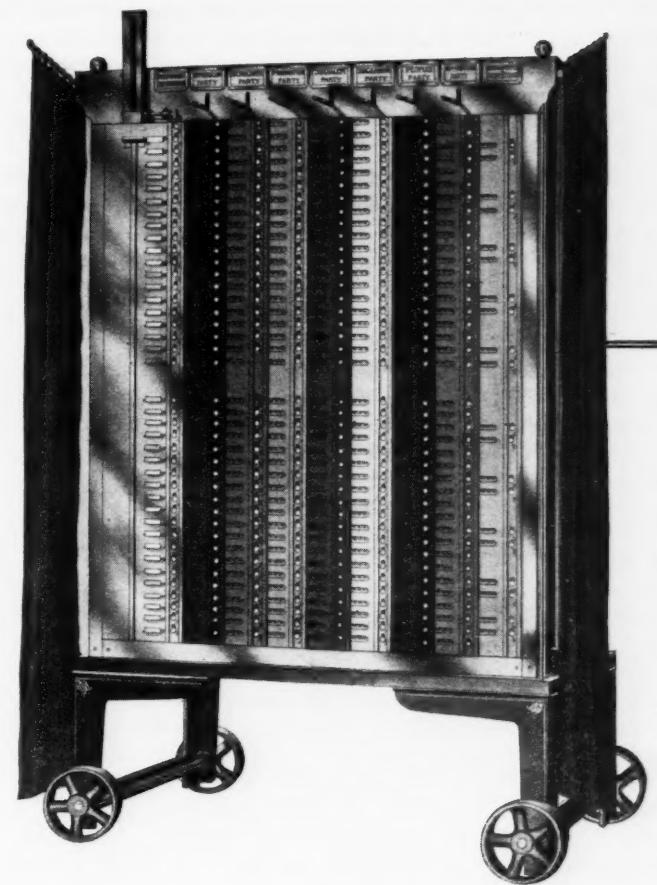
The machines may be run on natural, artificial, illuminating or producer gas, gasoline, distillate, kerosene or crude oil. The cost of fuel varies from \$.002 to \$.015 per hour according to quality and the price, which varies according to location.

All engines are thoroughly tested under actual load for several days before leaving the factory and a test card furnished the purchaser the accuracy of which is guaranteed by the company.

The Winslow Voting Machine

THE voting machine has come to stay. Its use as a means of obtaining quick results and honest registration of votes at all elections is meeting with general approval. Since its introduction in New York State some years ago it has come to be used in many States throughout the Union, from Massachusetts to California. THE MUNICIPAL JOURNAL has received inquiries about voting machines from nearly every State in the Union, and from several foreign countries, even as far away as Johannesburg, and for this reason information about new machines is always acceptable.

The Winslow Voting Machine is one recently patented and come into use. Wherever it has been used it has given eminent satis-



FRONT VIEW OF WINSLOW VOTING MACHINE

faction. It has been officially examined and approved by the Ohio State Board of Voting Machine Commissioners, at Columbus, O., and by the Illinois State Board of Voting Machine Commissioners, at Springfield, Ill. Both Boards give the machine their unqualified approval.

In the past ten years various machines have been placed upon the market, all of which have had objections which prevented their general adoption. With some the record has been inaccurate, others too complicated to be readily understood by the voter, while others are so faulty in their construction as to be unreliable. The principal objection, however, has been lack of adaptation to all classes of voting carried on in different localities, as each State and, in some cases, each city requires a different adjustment of the machine to meet its local demands.

The Winslow Automatic Voting Machine meets all objections that have thus far been raised. There are no springs, weights nor other devices employed either in casting a vote or determining the result after the polls are closed, and so there is nothing to get out of order. Its mechanism is so simple and its manipulation so easy that the voter is not confused when using it. The machine is so constructed that it may be readily adjusted to suit any condition that may arise or any class of voting carried on in this country, including single office voting, class voting, minority representation voting, restricted voting, amendments and proposition voting and cumulative voting, and at the same time permitting a straight ticket to be voted and a vote added to each and every name on the ticket, by the operation of a single voting lever by the voter.

The simplicity of the machine is so apparent even upon first inspection that the most inexperienced voter will find it impossible to make mistakes and so lose his vote. Inasmuch as the simple mechanical principles have been applied throughout the machine, there is no danger of its becoming disabled under the most severe trials, and at the same time accuracy, speed and durability are assured. Municipalities, whether large or small, will find it to their advantage to adopt this mode of voting as the use of the Winslow Automatic Voting Machine reduces the cost of elections from 20 per cent. to 50 per cent. The capacity of the machine is larger



REAR VIEW OF WINSLOW VOTING MACHINE

than that of most machines on the market, as one machine will safely handle from 600 to 800 voters and every vote can be cast in from ten to thirty seconds. In the use of this machine "repeating" is an impossibility, while a secret vote is compulsory, and the complete result of the election may be known instantly when the polls are closed.

Unlike most voting machines, there is a series of public registers in connection with the Winslow, so arranged on the outside of the machine in view of the public that anyone may ascertain at all times how many men have voted. Furthermore, it is the only machine on the market which shows how many women have voted and how many men, as well as the aggregate number of both men and women.

The rights of the independent voter are respected, and a provision is made for him to write in the name of any person of his own selection for any office he may choose.

In voting for presidential electors the voters may vote for the electors of the various parties themselves and are not required to vote a straight electoral ticket, as on the other machines.

Positively interlocking and limiting mechanism enables the voter to vote for any and all the candidates which he is entitled to vote for, and prevents him from voting for more than he should. Everything about the machine except the actual operation of voting is automatic. The person wishing to vote enters the voting compartment through the medium of the turnstile, opens the machine; before him are the various tickets in vertical rows—see one of the accompanying illustrations—and at the top of each row is a straight ticket lever. To vote a straight ticket the voter simply pulls the lever and then leaves the compartment. To vote a mixed ticket the voter may operate the straight ticket lever which moves all the keys in that column to a voting position. He may then replace the keys of the candidates he wishes to supply, and operate corresponding keys in any other column. Should the voter make an error in casting his vote he may correct the same as often as necessary before leaving the compartment. The exit of the voter from the compartment replaces all operated parts for the next voter. At the close of the polls the result of the election may be immediately ascertained by the movement of a single lever, when the entire record of the day's vote is revealed at a glance and the total result may be known within five minutes.

This machine is just what the term implies, a voting machine, not a ballot machine, as no ballots, balls, discs, attachments or other paraphernalia are necessary in its use.

The Winslow Voting Machine embodies everything necessary to conduct an election in the largest city or the smallest country precinct in any State in the Union, and produce at the close of the election or at any other time provided by law the total vote correctly added upon metal dials of each and every candidate and proposition to be voted for, the total number of male voters, the total number of female votes, the total number of restricted votes, the total number of unrestricted votes and the aggregate of all votes cast in the election, without the necessity of counting or calculating in any manner.

The manufacturers of this voting machine will be pleased to furnish additional information to anyone that may be interested. Address Winslow Voting Machine Company, Cleveland, O.

The "Glazier" Fire Nozzle

THE Franklin Institute, acting through its Committee on Science and the Arts, investigating the merits of the "Glazier Fire Nozzle," invented by John T. and Peter F. Glazier, of Indianapolis, Ind., recently made the following report:

"The apparatus described in this report is protected by United States Patents No. 608,192 and No. 688,407. The device is a hose pipe and connections, designed for the purpose of overcoming the difficulty of handling fire streams from hose lines under high-pressure service, also for the purpose of directing a stream at a specified point continuously, without attention from firemen. The apparatus is constructed of brass or other suitable metal, and consists of a play pipe connected by a swivel joint to a curved waterway attached to a

hose connection by a ball-bearing joint so that the play pipe can be moved in two directions—in planes at right angles to each other. In the "B" style, with single curved waterway, the stream from the hose after passing through the curve is delivered into a chamber with elliptical cross section, and thence through the play pipe. In the "A" style, having two curved waterways diverging directly above the ball-bearing joint, the water stream is again united in a bell-shaped chamber and passes thence through the play pipe. Either style can be directly coupled to one hose line, or can be attached to a Siamese hose connection, allowing two or more hose streams to be concentrated through the apparatus. The apparatus is manufactured in various sizes up to a delivery of 3½-inch streams at mouth of play pipe.

"In order that the possible loss of pressure in hose stream due to the curved arms of the apparatus might be ascertained, a test was arranged at the high-pressure pumping station at Race street and Delaware avenue, Philadelphia. A double-armed nozzle was attached to two 2½-inch hose lines Siamesed into base of nozzle. Water was supplied by a fire boat with a capacity of 1,300 gallons per minute. Gauges were inserted, one below the curved arm, and the other at the base of play pipe. The following readings were taken, the figures indicating the *pressure in pounds*:

At Pump.	Below Curved Arm.	Base of Play Pipe.
80	65	60
100	85	80
125	105	95
150	130	120
175	165	155

Showing a maximum of a loss of 10, which did not increase materially on increase of pressure.

A second test, made at Waltham, Mass., is reported as follows:

At Pump.	Below Joint.	Above Joint.
75	36	32
125	65	58
150	80	70
175	90	80

"Both tests show practically the same results; i. e., a loss of 10 pounds pressure above or below the curved arms.

"The apparatus described is adaptable to various fire department devices, such as monitor wagons, water-towers and, above all, for use in connection with hose streams in a stationary position without attention from a fireman.

"In view of the above, the Committee on Science and the Arts of the Franklin Institute would recommend the award of a certificate of merit to John T. and Peter F. Glazier, the inventors of the device. Adopted at the stated meeting of the Committee on Science and the Arts, held Wednesday, December 7, 1904. John Birnibine, President; Wm. H. Wahl, Secretary. Countersigned, Lewis M. Haupt, Chairman of Committee on Science and the Arts.

"Air Power"

"AIR POWER" is the name of a new quarterly, of which No. 1 Vol. I has just appeared on the editor's table. It is edited and published by the Rand Drill Company, 128 Broadway, New York. It says editorially:

"We are in no sense endeavoring to enter the field of legitimate journalism, as it would be impossible for a company manufacturing mining machinery to discuss and write impartially on subjects pertaining to the equipment and operation of mines.

"Neither the Rand Drill Company nor its mouthpiece, 'Air Power,' wishes to sail under false colors; and for this reason we state explicitly that the object of this paper primarily is to keep in touch with compressed air users, and to educate them to feel that they can call upon us whenever they wish to ask questions or discuss any subject pertaining to the varied uses of compressed air.

"We are also glad to publish, from time to time, articles that bear on the operation and conduct of shops, and mines, and plants which are intimately connected with the field which we shall cover."

This is an open and frank statement and one which will materially assist the Rand Drill Company in carrying out its purpose. It shows that the Company is animated by the progressive spirit and there is little doubt that its enterprise will be rewarded to the full measure deserved. THE MUNICIPAL JOURNAL welcomes its appearance and wishes it success and a long life.

Automobile Street Sweeping

SWEEPING streets with an automobile is a late and a practical invention introduced by the International Sanitary Street Cleaning Company, of Hartford, Conn. The sweeper shown in our illustration is really but a model put out by the company to test it under every condition of actual work. It was sent out from the works last August, and has been experimentally used in a number of cities with very satisfactory results.

It consists of a motor, clutch and transmission gear for propulsion, a circular broom that sweeps into an elevator that, in turn, dumps the refuse into a dirt box. Two water tanks supply a spray



THE NEW SANITARY STREET SWEEPER

that sprinkles the street immediately in front of the broom, and does entirely away with the dust generated by the ordinary method of sweeping from the center of the street to the gutter. The dirt box can be automatically dumped into a receiving cart at any time by a lever at the driver's seat.

The machine works on all classes of pavements, and traveling at a rate of from six to ten miles per hour, with a brush six feet wide it is capable of doing the work of a large number of "White Wings." The dirt box has a capacity of 1½ cubic yards, and the water tanks a capacity of 260 gallons, which is sufficient for an hour's time.

It is not, in appearance, a handsome machine, as its width, high boxes for water and dirt, and short wheel bars, by which it is possible to turn it completely around within the radius of its own length, gives it a clumsy shape, but its saving of labor and saving of dust will atone for its lack of beauty.

It is equipped with a 24-h. p., four-cylinder, vertical motor, which is placed in front, and secured by two 3½- x 8-inch oak timbers, that run from the front to the rear of the cylinder, and are supported on the wooden frame that carries the water tanks and dirt box. The motor is of the standard four-cylinder type, and the cylinders of the gas engine are cast in pairs and water cooled. The inlet valves are directly beneath the spark plugs and the exhaust at the opposite side of the cylinders. This arrangement gives the best explosions and an easy running motor. The fly-wheel is at the rear of the motor. The current, after the motor is started, is supplied by an Appel dynamo placed at the left side of the motor, and driven by a double cylinder belt from the fly-wheel.

The gasoline tank has a capacity of thirty-five gallons and is filled through a small pipe near the top. The water tanks are so constructed that the water passes through the cylinder jackets before it reaches

the sprinkler, thus performing the cooling without the use of a fan or radiator, and when not sprinkling a circulation is maintained by gravity.

There are three speeds and a reverse controlled by a sliding gear transmission over the rear axle; this is of the type used in the large touring cars, but geared lower. The speeds are four miles, for work in heavy mud, eight miles, for asphalt, brick, macadam, or ordinary pavements, and fifteen miles for traveling when the brush is not in use. The reverse is three miles.

The running gear is of the heavy truck pattern, the axles being two and one-half inches square, of open hearth steel, with plain bearings. The road wheels are forty inches and forty-two and one-half inches, with eighteen spokes, and are fitted with three and one-half inch solid rubber tires. The body and machinery are supported by four twelve-leaf springs attached in the usual manner.

A 24-inch steering wheel connects by a shaft to successive pinions, which last meshes into a semi-circular track on the front axle so that the machine turns readily and in harmony with the steering wheel. Two turns of the wheel give a right angle to the road wheels.

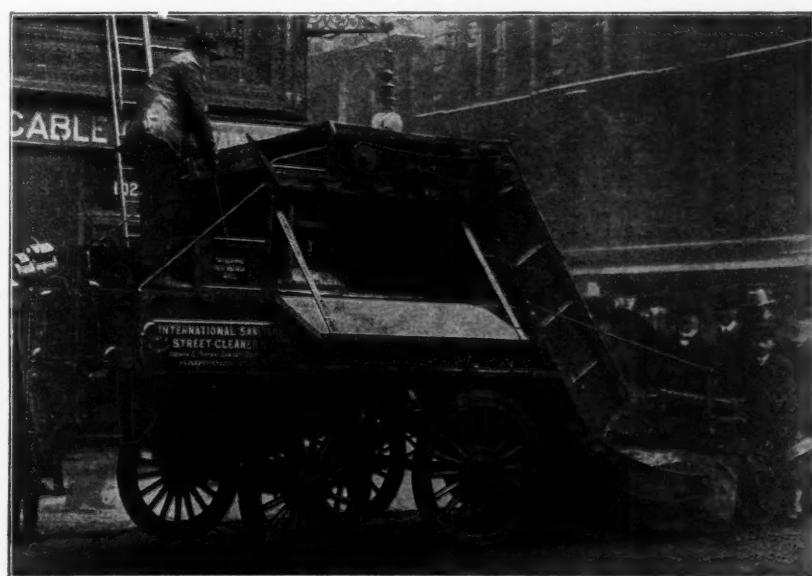
In operating the driver can control every part of the apparatus by levers at hand without leaving his seat. He can set in motion, regulate the speed, apply the brake, reverse, steer, turn on the spray, throw the sweeper in gear and dump the dirt box.

The water tanks are filled through a hose attachment and with the tanks full the machine weighs 7,200 pounds. The short turning gear permits its use in narrow or crowded streets, and its superior speed and greater efficiency in cleaning over the horse sweepers, which merely throw the dirt into the gutters, and the saving in dust by sprinkling and gathering at once are all points of excellence.

The manufacturers intend for the present to make but one size machine which will be leased and not sold. Brooms last about thirty days, but the core may be sent to the factory to be refilled with rattan.

Safeguard Against Slipping

EVERY public building should be equipped with any device that will make life more safe, more endurable or more enjoyable. In such matters the progressive city does not practice the picayune economy; but rather chooses the wiser course and adopts every-



THE AUTOMOBILE STREET SWEEPER

thing which will bring its public buildings up to date in every form of construction. For the foregoing reasons public building inspectors and custodians of city property, especially of public school buildings, city halls, fire and police stations, court houses and the like, will be interested in the "Universal Safety Tread." This is a device designed specifically as a safeguard against slipping on steps, stairs, sidewalks, elevators, cars, decks, mills, etc., etc. It is endorsed and used by the United States Government, approved by architects, engineers and builders everywhere. It is patented both in the United States and foreign countries.

It is a combination of lead and steel, or other hard metal, and so constructed as to always present a large surface of lead to the foot, thus giving the hold or grip that prevents slipping. Other treads have been made and experimented with from time to time, but in all cases where constructed of lead in combination with steel the tread has come to be more slippery than the old-style tread.

The "Universal" differs from all others manufactured in that the happy medium of lead and steel has been discovered so that it performs its work perfectly, and wears for many years.

The tread is so manufactured that it can be adapted to any kind of stairs, including wood, metal or stone. The fact that the cities of Boston, Buffalo, Fall River, Hartford and others have adopted the "Universal Safety Tread" for their public schools, will be of interest to all city officials. Moreover, when it is known that the Manhattan and Brooklyn Elevated Railways are equipping all their stations with this form of tread, as well as their electric cars, it will be understood that it is the best possible safeguard against accidents of slipping on stairways or car steps. Descriptive matter and full particulars may be secured by addressing The Universal Safety Tread Co., No. 45 Broadway, New York.

Publications Received

—AMONG the calendars received are the following: Robert M. Kellogg, Metuchen, N. J., maker of the Kellogg repair sleeve for repairing leaks in water mains; Masurite Explosive Company, New York, maker of the well-known safety explosive of that name; The Vulcan Iron Works, Toledo, O., maker of "Vulcan" steam shovels; Hersey Manufacturing Company, South Boston, Mass., makers of water meters; Pittsburgh Meter Company, East Pittsburgh, Pa., makers of water meters; and the Morris Machine Works Company, Baldwinsville, N. Y., makers of centrifugal pumps; Charles C. Moore & Co., San Francisco, Cal., engineers, high grade machinery, contractors for complete plants for power, lighting, pumping and mining; The Big 4 Route, Warren J. Lynch, G. P. A., Cincinnati, O.; and the National Electric Company, Milwaukee, Wis.

—The Blakeslee Concrete Block & Machine Company, Columbus, O., is out with a new illustrated catalogue. It describes both the Blakeslee machine and its product, the Blakeslee block.

—Superintendents of water works, water supply people generally and aldermanic committees dealing with the water supply question will be interested in the 16-page illustrated catalogue of the Artesian Well & Supply Company, Dyer and Friendship streets, Providence, R. I.

—The Lake Shore and Michigan Southern Railway continues to issue its attractive book of trains. This is the route to Chicago, it will be remembered, over which the U. S. Government runs its fast mail trains between New York and Chicago. A. J. Smith, G. P. and T. Agent, Cleveland, O.

—The Studebaker Farmers' Almanac and Weather Forecast is out for the sixth year. Besides atmospheric conditions it tells about the Studebaker wagon, harness and other products of this well-known concern. A postal card request to the Studebaker Brothers Mfg. Company, South Bend, Ind., will secure a copy.

—J. W. Howard, C. E., E. M., consulting engineer, 1 Broadway, New York, is sending out a map of the world showing where the

various deposits of asphaltum and compounds, maltha and glance pitch may be found. Mr. Howard is an expert on street construction and pavements of all kinds, including asphalt and bitulithic.

—The American Well Works, of Aurora, Ill., has recently issued a revised catalogue which is profusely illustrated, of their full line of improved machinery for well sinking and prospecting, including artesian well and compressed air pumping machinery, air compressor, gasoline and steam engines, boilers. The company has branch offices at Chicago and Dallas, Texas, and agencies in New York, Pittsburgh, Pa., Montreal, Canada, London, Eng., and Rio de Janeiro, Brazil.

Items of Interest about the Trade

—THE C. O. BARTLETT & SNOW COMPANY reports a large number of recent sales of its different kinds of machinery, including elevating and conveying machinery, mining machinery, paint machinery, steam hoists and derricks, rotary and steam dryers. Shipments have been made to all parts of the United States.

—The firm of A. L. Ide & Sons announce that they have established a New York office at 11 Broadway, through which all export, New England and Middle States business will be transacted hereafter, the management being entrusted to Mr. J. G. Robertson. The works and general offices of this concern are located at Springfield, Ill.

—Mr. Maurice E. Baird, who has been connected with the Eureka Fire Hose Company for several years with headquarters at Chicago with his brother, has been assigned to new territory. Hereafter Mr. Baird will represent the company in Iowa, Northern Wisconsin, Minnesota, North and South Dakota and Montana. His headquarters will be at Minneapolis, Minn.

—On January 6, 1905, the City of Pittsburgh, through its director of public works, E. M. Bigelow, awarded a contract to the Pittsburgh Meter Company, of East Pittsburgh, Pa., for 5,000 water meters, ranging in size from five-eighths of an inch to six inches, inclusive. This order will be filled with the well-known Keystone Water Meter. It is reported that Pittsburgh intends, in the near future, to place a meter on every tap which will require in the neighborhood of 75,000.

—Mr. E. J. Williams, who has been connected with the Austin Manufacturing Company as manager of branch houses and department manager for the past eighteen years, has tendered his resignation to take effect January 1, 1905, in order to take charge of the Williams Contractors' Supply Company, of Columbus, O. Mr. Williams will continue to handle a full line of the Austin Manufacturing Company's goods, also a full line of the products of the Western Wheeled Scraper Company, Aurora, Ill., and, besides, will carry a full line of supplies used by general contractors.

STREET SPRINKLING IN ROCHESTER, N. Y., is advertised and let in a single contract instead of being divided into groups. The estimate for 1898 was \$46,898, the bid \$43,161, equal to 92 per cent. of the estimate, and the cost was \$41,227. The figures for subsequent years placed in the same order are: 1899, estimate, \$50,162; bid, \$33,403, per cent. 66.5; cost, \$31,044. 1900, estimate, \$51,496; bid, \$28,056, per cent. 54.5; cost, \$26,855. 1901, estimate, \$52,060; bid, \$40,191, per cent. 77.2; cost, \$39,940. 1902, estimate, \$53,851; bid, \$40,130.20, per cent. 74.5; cost, \$42,432.49. 1903, estimate, \$54,484; bid, \$35,959.44, per cent. 66; cost, \$39,936.46. The average cost per mile was about \$354, and per square yard, 2.24 cents, figured on a basis of 27 feet as the average width of street sprinkled.